The

Electrical Review

VOL. XCVII. OCTOBER 9, 1925. No. 2,498.

THE OLDEST ELECTRICAL PAPER. ESTABLISHED 1872.

Published every FRIDAY, Price 6d.

Chairman: H. ALABASTER.

Technical Editor: A. H. ALLEN, M.I.E.E. *Joint Managing Directors:* G. H. ALABASTER. E. A. GATEHOUSE, M.I.E.E. A.M.INST.C.E. *Commercial Editor:* A. H. BRIDGE.

Manager and Secretary: E. S. MIDDLETON.

OFFICE: 4, LUDGATE HILL, LONDON, E.C.4.

Telegraphic Address: "AGEKAY, CENT., LONDON," Code, A B C. Telephone Nos.: Central 8260 and 8261

The "Electrical Review" is the recognised medium of the Electrical Trades, and has by far the Largest Circulation of any Electrical Industrial Paper in Great Britain.

SUBSCRIPTION RATES, Postage Free: United Kingdom, £1 14s. 8d.; Canada, £1 12s. 6d.; Colonial and Foreign, £2 1s. 6d. per annum Cheques and Postal Orders (on Chief Office, London) to be made payable to THE ELECTRICAL REVIEW, LIMITED, and crossed "Midland Bank, Newgate Street Branch."

LIST OF FOREIGN AGENTS (see first page "Official Notices").

Contents:

	PAGE
New Electricity Supply Areas	561
Rural Overhead Lines	562
The Electrical Outlook in China	562
Hungarian Railways	563
The German Wireless Apparatus Industry	563
Suggestion Schemes	563
Mining Electric Locomotives—II (*illus.*)	564
Control Gear for Beet Sugar Manufacture, by J. O. Knowles (*illus.*)	566
Electricity Supply in Great Britain—I (*illus.*)	568
Practical Nomography, by Reginald O. Kapp (*illus.*)	570
Reviews	572
Business Notes	573
Lighting and Power Notes	578
An Electric Wire and Small Fittings Factory (*illus.*)	579
Hydro-Electric Progress in Switzerland (*illus.*)	581
Tramway and Railway Notes	583
Telegraph and Telephone Notes	583
Radio Notes	584
Contracts Open and Closed	584
Forthcoming Events	585
Notes	585
Institution Notes	587
Our Personal Column	587
New Companies Registered	589
Official Returns of Electrical Companies	589
City Notes	589
Stocks and Shares	590
The Berlin Wireless Exhibition (*illus.*)	591
New Electric Fires (*illus.*) (*continued*)	592
Church-bell Ringing by Electricity (*illus.*)	594
The Import Trade of China	594
Selected Radio-telephone Apparatus (*illus.*)	595
The Institution of Public Lighting Engineers (*illus.*) (*concluded*)	596
Correspondence—	
Broadcasting Power	598
The Æsthetic Aspect of Advertisements	598
Radio Aerials and Lightning Discharges	599
The Cost of Living in Bombay	599
Rural Electricity Supply	599
The Roman Baths at Bath	599
The Manufacture of Induction Motors	599
Is the Contracting Business Degenerating?	599
Legal	600
Published Specifications	600
Contractors' Column	Advertisement page xxxvi

New Electricity Supply Areas.

THE report recently issued by the Minister of Transport respecting proceedings under the Electricity Supply Acts includes a list of the Special Orders made by the Electricity Commissioners during the year under review (to March 31st, 1925). A rough analysis of these Orders may be of interest as indicating the new territory which will thus be catered for in the way of electricity supply, who are the enterprising authorities, and generally the direction which developments are taking.

There are 73 Special Orders altogether, of which 72 authorise supply to new areas and one authorises a transfer of part of an undertaking. Of the 72 Orders for new areas, local authorities have promoted 33 and companies (or persons) 39.

From the nature of the case, all these Orders refer to country areas or small towns. Two of the Orders refer to "cities," but these are the city of Lichfield and part of the city of Wakefield. For the rest, the Orders relate to county boroughs, urban and rural districts, and parishes.

From the point of view of the much-discussed rural development, it is interesting to note that out of the 72 Special Orders, 47 Orders are for supply to rural districts, covering indeed the big number of 93 rural districts in whole or part. The urban districts covered (68) are, of course, also almost exclusively country areas. To the foregoing have to be added 26 parishes and 20 boroughs (of which the most important is, perhaps, Newark-upon-Trent).

One interesting aspect of these Orders is the indication they give of an increasingly popular policy with local authority undertakers, namely, that of extending their areas of supply to the surrounding rural districts. One of the most ambitious of these is Luton, which is extending outwards in a very wide sweep, including Dunstable and rural districts in Bedfordshire, Buckinghamshire, and Hertfordshire. The Bedford undertaking is likewise extending its boundaries, so that these two local authorities will together cover a fairly extensive area.

Worcester is similarly proposing to supply the rural districts to a three- or four-mile radius round the city. This is an element in the South-West Midlands District scheme. Sheffield, Middlesbrough, and Leicester have also secured Orders for extensions into the surrounding country. Of the provincial companies which are similarly expanding their boundaries, the Northampton Supply Co. has a fairly ambitious programme under its Order covering extensive rural and urban dis-

tricts and Daventry. The Oxford Company is extending to Woodstock and elsewhere, and the Abingdon Company is also expanding. The two undertakings, we understand, either have been or will be interlinked. Another company which is interested in rural supply, in fact, mainly engaged in it, is the Western Electric Distributing Corporation, whose West Wilts. Order covers Chippenham, Devizes, Westbury, and a comprehensive slice of that rural country. The power companies are also getting new customers for their bulk supplies by taking out Orders. The Lancashire Power Co. has obtained an Order for the urban district of Golborne, and Electrical Distribution of Yorkshire, Ltd. (the feeder to the Yorkshire Power Co.) has taken out three Orders covering a formidable number of rural and other districts, some 28 altogether. The Lothians Electric Power Co. is fulfilling its obligations (in partnership with the Edinburgh Corporation under the Edinburgh and Lothians Electricity District scheme) to provide "a cheap and abundant supply of electricity" within the portion of the district for which it is responsible, by an Order with a voluminous list of burghs and parishes.

Finally, there is the London and Home Counties Electricity District, which offers very little scope for new Orders. Nevertheless, the few remaining unappropriated spots are being decreased in this list by the following: The County of London Co. has taken Orders for some of the unappropriated areas of Essex, the Leatherhead Co. has staked out a claim in the Epsom rural and Guildford rural areas, the Egham and Staines Co. and the Woking Co. have secured such parts of the rural district of Staines as are innocent as yet of electricity supply, and the Urban Co. has taken up uncatered-for areas in the rural districts of Reigate and Godstone.

In view of the interest attaching to the changing panorama of electrically supplied areas, we have thought it worth while to commence to publish a series of maps illustrating the position up to the time of printing. In some parts of the country, practically the whole area is already parcelled out to statutory undertakers, and, of course, almost all of the "unoccupied areas" are of the rural type, wherever they are met with. We shall deal first with the counties which are still far from completely covered, and afterwards with those offering less scope for new enterprise, omitting counties the whole of which has been allotted to the care of authorised undertakers of one sort or another. The first of these maps, dealing with Bedfordshire, Bucks and Northants, appears in this issue.

Rural Overhead Lines.

Recent correspondence, following on comments in these pages, has recalled attention to the regulations which control the construction of overhead lines for pressures above 125 volts, and to the restrictions thereby imposed upon the development of electricity supply in rural areas. It may not be generally realised that the residents in such areas, which have hitherto been regarded by many as an unpromising field for electricity, are eager to avail themselves of its benefits directly the mains come within hailing distance, and the only obstacle to the satisfaction of their longing for release from the tyranny of the paraffin lamp and oil-cooking stove is the cost of the transmission lines.

That the existing regulations seriously impede rural development is certain, and that there is no necessity for their excessive stringency has been witnessed by Mr. W. Fennell and Mr. R. Borlase Matthews in our columns, whilst we have repeatedly received similar testimony from other engineers in private conversation. Further corroboration was given by Mr. R. B. Mitchell, president of the Incorporated Municipal Electrical Association, at the recent meeting of the Institution of Public Lighting Engineers at Leeds; as reported elsewhere in this issue, Mr. Mitchell, who is chief electrical engineer to the Glasgow Corporation, referred to the rapid extension of electricity supply that is taking place in rural areas, and declared that the "very rigid Board of Trade regulations" were a great handicap to the development of rural electric lighting. Mr. E. C. Lennox, the author of the paper under discussion, who is familiar with rural distribution, agreed, and said they could hardly move for the regulations "rigidly round their necks."

We feel sure of two things: that we are making ourselves ridiculous in the eyes of the rest of the world by maintaining these restrictions, to the detriment of everyone concerned; and that if the electrical fraternity unanimously expresses a wish for the drastic revision of the regulations, the Electricity Commissioners will be found very willing to accord a sympathetic hearing to its representations. So far as the Post Office requirements are concerned, we have in the letter of Mr. S. C. Bartholomew, published in our "Correspondence" columns to-day, evidence that the Engineering Department is by no means unfriendly to the development of rural electricity supply networks, and, with other information which has reached us, we are encouraged to believe that in no long time from now the situation will be materially improved.

The Electrical Outlook in China.

He would indeed be a bold man who would seek to prophesy what prospects China offers in the immediate future for the British electrical exporter. Those enterprising spirits who, decades ago, foresaw that they could benefit China as well as themselves by introducing modern methods into Chinese industrial life and who devoted their capital and energy to building up a market for electrical apparatus and supplies have passed through a period of serious anxiety in recent years. Civil war and brigandage have combined to hamper transport and trade. With the gradual undermining of the authority of the central Government the finances of the country have gone from bad to worse. Throughout the land the treaty rights under which the whole system of Chinese trade has been built up have been increasingly disregarded. Yet amidst this growing unrest and dissension there have been wonderful examples of vitality and recuperation. Customs receipts, which have remained under foreign control, have shown increases where none was expected, and in the foreign trade returns there have also been advances. It is true that the statistical records go no further yet than 1924. The progressive decline between 1921 and 1923 in the tael value of imports of electrical material and fittings was arrested in 1924. In that year their total value was Hkwn. tls. 8,420,098 against Hkwn. tls. 8,266,181 in 1923. What the 1925 figures will be it is hard to say, but we have always urged the British exporter to cultivate the Chinese market, and we still believe that in time he will reap his reward. British material and workmanship still bear a high reputation. The Chinese have not forgotten some bad accidents that took place not many years ago owing to the use of inferior foreign electrical apparatus. Whilst the principal users of electricity are cotton mills, flour mills and oil mills, the most promising line of development at present is in lighting, from town schemes down to small units of 2½ to 10 kW for provincial residences. Hydro-electric plant is practically non-existent, although water power is available in many districts.

It has always been said of the Chinese market that, despite political troubles and internal disorder, business at the Treaty ports would thrive; but Bolshevism, boycott, and strike have so damaged business in recent months that it will take a long while to remedy the disaster. Yet there are a few rays of hope in an otherwise gloomy outlook. In contrast with the turbulent spirits who have been fomenting the anti-foreign movement, many Chinese industrialists thoroughly recognise that the future of the country, like its past, lies in the co-operation of the foreigner. The old-established Chinese merchants are men of great business acumen, and it is their influence as much as any that has led to the fixing of the date for the long-deferred Tariff Conference and to the settlement of the Shanghai strike. An attempt has even been made to produce some semblance of order and authority in Peking by the time the conference assembles there on October 26th. The British delegates have been told by Mr. A. Chamberlain

that, when dealing with the question of raising Customs duties, they must require security for China's performance of her promise to abolish the internal duties known as "likin." On the other hand, the great difficulty is to find amidst the welter of party faction any authority whose promise is likely to be performed. A change for the better may, however, emerge from the fact that, apart from the Bolshevist agitation, there is a truly national movement for freeing the country from foreign control and influence. This national movement is the more moderate of the two, and it is hard to believe that with the example of Russia before them the saner elements will not be able to check Bolshevism. They must be persuaded to use their efforts to place in power responsible men who by their actions can convince the foreign Governments of their ability to restore order and protect life and property. When that is accomplished it will be time to talk of abolishing ex-territorial rights and doing without the foreigner. And unless that is accomplished China must expect henceforth to do without foreign capital or foreign co-operation and to see her agriculture and industries wither and decay.

Hungarian Railways.

It is reported that a Franco-Spanish group has dispatched representatives to Budapest to investigate the possibility of the electrification of the Hungarian railways, this group being said to be the same as has been interested in the conversion of Italian railways to electric traction. An English group is stated to have prepared a scheme some months ago for the construction of a power station based on the utilisation of the lignite mines of Varpalota for the supply of power for the working of the Trans-Danubian railways, but the project proved to be too costly. It is assumed not to be out of the question that the Loucheur group is at the back of the Franco-Spanish group, the former having acquired the majority of the shares in the Phoebus electricity works a few months ago, which supplies the vicinity of Budapest, and also having obtained an interest in the electrical and transport undertakings, which own many electricity works in the provinces and in ceded territory. If the scheme for the conversion of the railways should be realised the Franco-Spanish group would appear to be approaching the position of being able to control the electricity supply system of Hungary.

The German Wireless Apparatus Industry.

Dealing with the second large radio exhibition in Berlin, which has recently been closed, and which is dealt with elsewhere in this issue, Herr Hamm, of Charlottenburg, states that it was a great success, there having been 250 exhibitors and over 400,000 visitors. The economic results were not so brilliant as might appear from the outward circumstances, but most of the firms were satisfied. This is regarded as a very favourable situation having regard to the serious state of distress that the German radio industry experienced during the first two years of its existence. The impression is gained that the state of chaos has been ended and has been succeeded by quiet development. In itself the radio industry has been strengthened; it is controlled by the syndicate of the wireless industry, which also possesses a kind of monopoly for the Telefunken licence, which is provisionally indispensable. Moreover, a smaller syndicate exists, but this only comprises producers of component parts, and so far it has not become of any importance. The policy of the former shows unmistakably the endeavour to prevent, or as far as possible render difficult, the establishment of new concerns. Practically no new firms were noticed at the recent exhibition, but some names have disappeared since the initial period. The tendency of the technical economic development lies in the direction of bulk production, in conjunction with standardisation. The large reduction in prices which has taken place since the spring of 1924 can only be borne if the organisation of manufacturing yields the highest possible results. Whereas a four-valve set at that time was priced at 500 marks and then dropped to 350 marks, one firm has now produced a three-valve set at 135 marks, which can be converted to a four-valve set at an additional cost of 50 marks. If good component parts are used it is impossible at this price to get more than an insignificant profit, so that compensation must be sought for in bulk production. As for the quantities concerned, Herr Hamm states that one of the most important firms in the "low-pressure" branch produces 3,000 double receivers daily, which number is sold and could be increased to 10,000 daily if the works could turn out this number, while a smaller firm constructs 50,000 per month.

Concerning the export possibilities of the German radio industry, Herr Hamm states that these are still favourable. For instance, a head-'phone costs from 8 to 14 marks in Germany according to quality, whereas the price in England and America is 20s. It is argued that with such a price difference Customs barriers cannot entirely stop the export trade, and, in fact, large quantities are being exported to America which are not yet specifically enumerated in the German official statistics.

Suggestion Schemes.

The basic idea of the suggestion scheme is unquestionably a sound one; there is nothing Utopian about it, and it can be abundantly justified on purely utilitarian and economic grounds. Where a scheme has really succeeded, it has given satisfaction to all parties directly concerned. At the same time, however, the history of actual experiments in this direction, it is to be feared, makes but mixed reading. There have been, and there are, quite notable successes; but there have been also failures. Unfortunately, it is the derelicts and cripples which are most noticed and commented upon, and all too often the efficient schemes are passed by in silence. There is certainly no inherent reason why a wisely conceived, soundly executed programme should not fully satisfy all reasonable expectations. A sound scheme working smoothly not only aids efficiency, it is itself a token of efficiency. It also suggests confidence, and may express even cordiality, in the relations as between management and executive. These are prime essentials.

Probably the foremost reason why so many of these experiments are still-born, or fail to reach maturity, is just the fact that those responsible for their inception, and entrusted with their execution, overlook the human element that is involved. The psychological factor here looms large: nowhere, indeed, is it more in evidence. It has to be remembered that success is the logical outcome, not of a purely negative thing, as mere acquiescence, but of something positive, as a species of enthusiasm. More than that, the enthusiasm has to be shared; in other words, there must be keenness alike to solicit suggestions, on the one hand, and to offer them on the other. Employers and employés must be at one in this that they welcome the facilities the scheme provides. In addition, it is most necessary to obviate, if possible, all covert opposition from intermediary officials. To this end everything must be above board, and all concerned must be assured of a square deal. Suspicion, more than anything else, kills all such enterprises. Put in skeleton outline: The employers solicit proposals which shall ensure increased efficiency, &c. They promise that careful consideration shall be given to all suggestions submitted, and state in general terms the kind of thing they want. The offers which are accepted they will pay for at a fair price. In any case, they will give a reasoned reply when a suggestion has been turned down. The rest is matter of detail.

For those interested in the subject who wish to study details of actual schemes, and to realise more fully what is involved, a brochure entitled "Suggestion Schemes," prepared by the Industrial Welfare Society, of 51, Palace Street, Westminster, S.W.1, can be recommended. Guiding principles, exposition of schemes, details of working, including suggestion box and other methods, questions affecting adjudication and assessment of values, and of dealing with appeals, are all treated with judgment, and clarity. The nine appendixes in particular give just the kind of data that those thinking of inaugurating an actual scheme will find of most use.

Mining Electric Locomotives.—II.

Battery-Propelled Machines submitted for the Markham Competition.

IT is of interest to record the fact that of the five locomotives which competed in the final tests for the £1,000 prize offered by Sir Charles Markham for a machine suitable for use in place of the pit pony for the haulage of tubs in coal mines, three (including the prize winner, which was described last week) were fitted with standard Kathanode batteries manufactured by the D.P. Battery Co., Ltd.

The locomotives had to be designed to meet the arduous conditions met with underground. The machine built by the Metropolitan-Vickers Electrical Co., Ltd., was designed in accordance with the specification drawn up by the promoters of the competition; it was found impossible, however, to adhere to the weight specified and at the same time construct a locomotive which the designer considered to be sufficiently robust for all underground duties. The electrical gear was kept as simple as possible, and the M.V. machine is actually capable of turning through an angle of 90 deg. on a 13-ft. radius with an overhang not exceeding 10¼ inches, *i.e.*, 1¼ in. less than that specified.

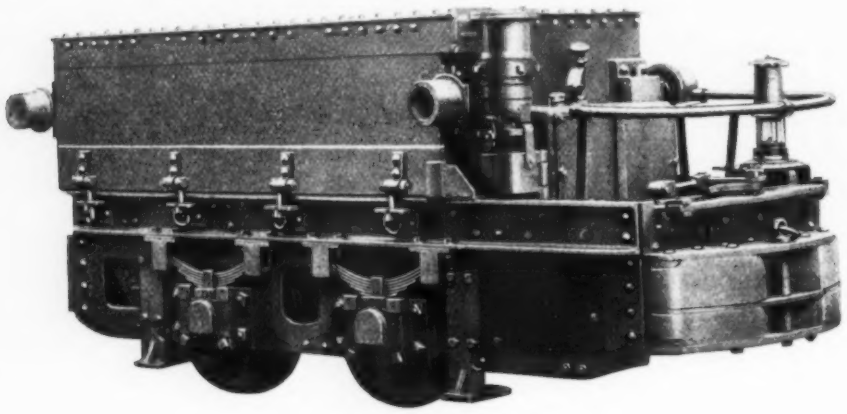


Fig. 1.—Metropolitan-Vickers Mining Locomotive.

The Metropolitan-Vickers Locomotive.

This machine is illustrated in figs. 1, 2, and 3; its battery was manufactured by the Chloride Electrical Storage Co., Ltd., and is of the "Exide-ironclad" locomotive type, consisting of 35 LMV-10 cells, which type of cell can give heavy current discharges without undue drop in the voltage, thus maintaining speed when negotiating steep inclines. The battery has a capacity of 323 ampere-hours at the 5-hour discharge rate; sufficient mud space is allowed, so that cleaning out is unnecessary during the life of the plates, whilst the head room over the plates is such that topping-up is minimised and acid sloppage practically impossible, qualities that make for trouble-free service.

The battery compartment is flame-proof and strong to withstand an internal explosion or a fall of roof; it is fitted with wide flanges separated by distance pieces to provide sufficient ventilation, the arrangement being such that it is impossible for the hot flame of an explosion to communicate with the outside atmosphere. All the terminals inside the batteries are suitably protected from short circuit. The case is made additionally strong by dividing it into three separate compartments which have specially wide flanges between them.

The two motors, one on each axle, figs. 2 and 3, are spring-suspended in the usual locomotive manner. The drive is through a double reduction chain, the high-speed chain being totally enclosed. The motors are enclosed in flame-tight covers, the terminal boxes being cast to the motor frame and forming separate flame-tight compartments through which the leads are taken by means of flame-tight bushes. Suitable inspection doors are provided for the motors in accessible positions.

The controller, enclosed in a flame-proof box, is of the cam-operated contactor type with a blow-out coil on each contactor; in addition, two interlock line switches with an overload relay are provided. The motors are reversed by means of a separately interlocked drum, the arrangement being similar to that provided on the standard Metropolitan-Vickers locomotive controller. This reverse drum is operated by a removable key which can only be taken off in the "off" position and also in this position the controller handle is locked so that it cannot be moved. In addition, the interlock is such that it is impossible to operate the reverse drum unless the controller handle is in the "off" position. The controller handle is of the "dead man's" type, and is so arranged that in the event of the handle being released the current is immediately cut off from the motors, and before it is possible to start up again it is necessary to return the controller handle to the "off" position. A flame-tight receptacle is provided on the battery box, into which a suitable plug engages. When the locomotive is in commission this plug is locked in place; similar locks are provided on the controller case so that it is impossible for any unauthorised person to open the controller case or remove the battery plug. In order to remove the battery box from the chassis, four special rollers are provided, which are detachable. These wheels would be kept in the charging station and would only be fitted at the station when it is required to replace a battery. The wheels engage with a side track, and the track on which the locomotive runs is slightly inclined to the horizontal, so that the weight of the battery is taken on the wheels provided, and by slacking off the retaining bolts it is possible for the battery box to be lifted out clear of the chassis. The locomotive chassis can then be run out to the re-charge battery station, where a reverse process takes place.

The locomotive has brakes on each wheel. The brake gear is of the compensated type and can be operated by either foot or hand. In order to lessen the possibility of generating sparks of sufficient heat to ignite gas when braking, the shoes have been lined with Ferodo. Sand boxes have been provided for each direction of running and are operated by suitable foot levers.

The Patterson Locomotive.

The rectangular steel-plate body of the machine (fig. 4) submitted by Messrs. R. H. Patterson & Co., Ltd., of Newcastle-on-Tyne, is 18 in. square and open underneath, the cab being attached to an extension of the frame and of equal strength to the main body. The overall dimensions are: length, 8 ft. 3 in.; height, 3 ft. 5½ in.; and width, 3 ft. 1½ in.; the wheel base is 22 in., and the maximum overhang on a 13-ft. curve is 7⅞ in. outside the outer rail. The weight of the complete vehicle is 2 tons 15 cwt.

The 10½-b.h.p. intermittent-rated, series-wound, totally-enclosed motor (by Messrs. Clarke, Chapman and Co., Ltd., of Gateshead) operates at 64 volts and a speed of 1,200 r.p.m. for full-load speed. The steel yoke has facings to fit exactly between the vertical members of the chassis and is rigidly bolted and dowled

to it. The transmission end of the motor shaft is enlarged, bored, and splined to take the driving shaft of a (Messrs. D. Brown & Sons) worm reduction differential mechanism, which is contained in a steel casing built into the main chassis. The reduction gear has a ratio of 10.5 to 1. The driven shafts of the differential

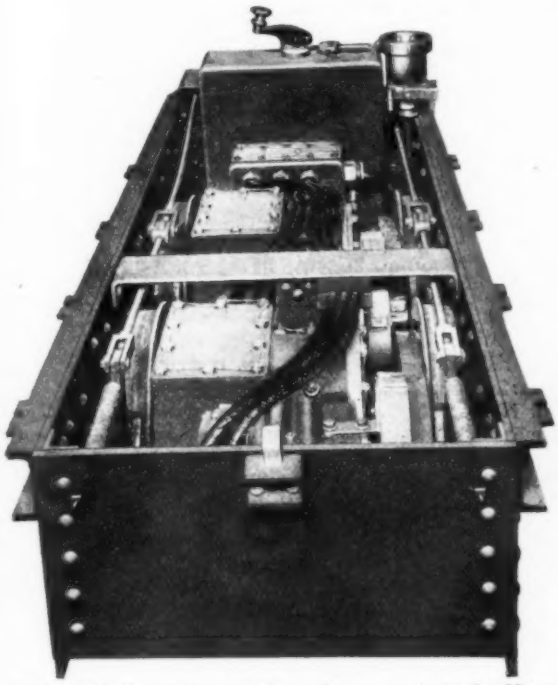


Fig. 2.—M.V. Locomotive with Battery Box removed, showing Motors.

extend through the sides of the chassis, and have two steel driving disks rigidly secured to them, each driving disk being provided with a nickel-chrome steel crank pin at 4½ in. radius

The track wheels have steel centres and main-line quality tires, and are mounted on the ends of the fixed axles with Hyatt roller bearings enclosed in the bossing of the wheel centres. Crank pins of nickel-chrome steel are secured to the track wheels at 4½ in. radius, and a compensated driving yoke of triangular form connects each set of wheels and the driving disks, one set on each side. In this manner differential action is transmitted to the track wheels through the driving yoke. The bearing taking the crank pin of the driving disk is a phosphor-bronze solid block sliding in the jaws of the driving yoke, and supported by a steel spring. The wheels are mounted in cast-steel horn blocks, sliding in machined pockets on the main chassis, and supported by steel springs of the same strength as the springs on the driving yoke. The bearings connecting to the track wheel cranks are of the "SKF" radial double-track ball type.

A totally-enclosed flame-proof controller (made by the Electro-Mechanical Brake Co., West Bromwich) is situated in the cab, combined with the same firm's flame-proof "unbreakable" resistance and a circuit breaker of the tramway type (by the English Electric Co.) enclosed in a flame-proof casing with automatic blow-out and handle control. A notched gate device on the controller lever ensures the steady cutting out of resistance step by step, it being impossible to short circuit across any step of the controller, and a mechanical spring return gives a "dead-man's" effect in case of accident to the operator, the controller handle returning to zero the moment it is released.

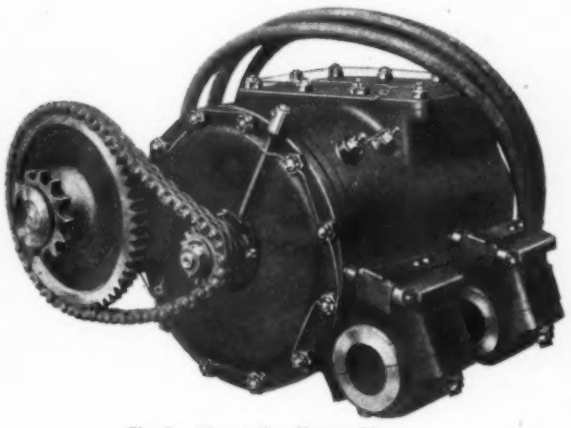


Fig. 3.—Metropolitan-Vickers Motor.

Brake drums 12 in. in diameter by 2¼ in. face are formed on the back of, and concentric with, the driving disks on each side. The two brake posts are curvilinear, and are pivoted on adjustable fulcrums mounted on the chassis. At the other end, a tension bolt passes through the extended ends of the brake posts, and is fitted with check nuts on the lower side, and cams mounted on the ends of the lay shaft engage with the upper leaves of the brakes, the tension head bolt being pivoted within the cam heads, so that upon the lay shaft being rotated by link and lever, the cam depresses the top leaf, and by imparting an axial motion to the tension bolt pulls the lower leaf equally and oppositely. The brake leaves are held open by a coil spring on the tension bolt, and the two brakes are synchronised to work simultaneously. Control is exercised by a lever with clutch and quadrant in the cab.

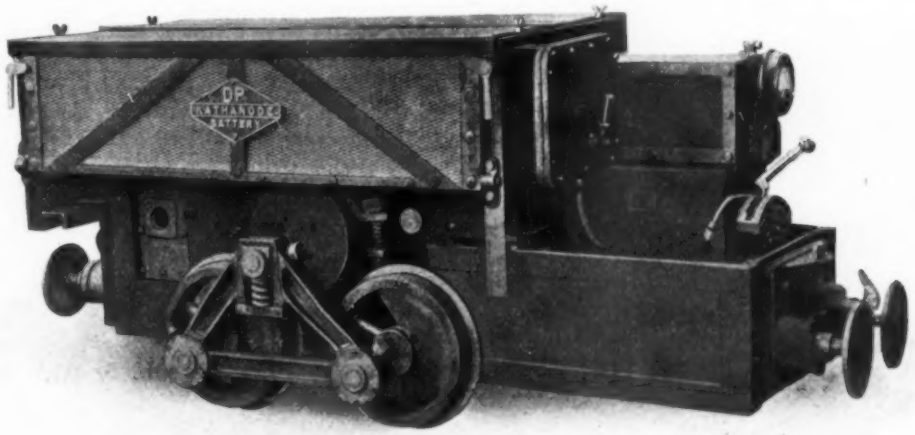


Fig. 4.—The Patterson Mine Locomotive.

The TR-29-type 32-cell lead-acid battery of the "Kathanode" series (manufactured by the D.P. Battery Co.) is contained in four teak crates, each portable by itself. The four crates straddle on the top of the chassis in a cage formed with two rigid end plates and two portable hinged doors, with portable cover. The terminals and inter-cell connections are heavily covered with rubber to ensure freedom from open sparking, and a voltmeter is fitted to show the open-circuit voltage as an indication of the battery's condition.

Steel headstocks with spring buffers and draw hooks are fitted at the forward and after ends. Sanding boxes are provided with dead-lift valves operated by pedals from the cab, one pedal controlling the forward pair and a second the after pair. The full-load haulage speed on a gradient of 1 in 24 is five m.p.h., the light speed being approximately seven m.p.h. The draw-bar pull has been tested to be between 1,100/1,200 lb.

The principal feature of the Patterson machine is the method of transmission between the prime mover and the track wheels. The differential gear imparts a differential action in curving to the driving frames, which, in turn, dispose the power in exactly equal parts to both track wheels. The spring-compensated sliding block gives a cushioning effect to the driving pin when starting under load, and also gives the wheels freedom to move vertically without straining the driving yokes in any way.

Control Gear for Beet Sugar Manufacture.

By J. O. KNOWLES, M.A.

In the manufacture of beet sugar large quantities of low-pressure steam are required for process work from the diffusing of the beet liquor to the refining of the crude sugar. This fact in itself suggests that electric power can be generated at a very low cost in the sugar factory, because the enormous condenser losses of the usual power station (comparable as they are to the actual electrical energy produced) can be at once diminished by using a turbo-generator exhausting into the process service instead of into a condenser.

The power required for the handling of the large quantities of materials is in the aggregate considerable and this power is required at widely scattered points in the process routes. Electrical drive is therefore a foregone conclusion, both because of the low cost of generation under the conditions stated above and because of the convenience and economy of electrical and individual drive as against a possible alternative of steam or Diesel-engine drive. Apart from these questions of cost and economy, the one essential for the auxiliaries is reliability. This is true of all process work, and of sugar manufacture in particular, because of the quantities handled in a continuous succession of processes, and because of the comparative instability of the syrups in the process stages and the demand for quality in the finished product.

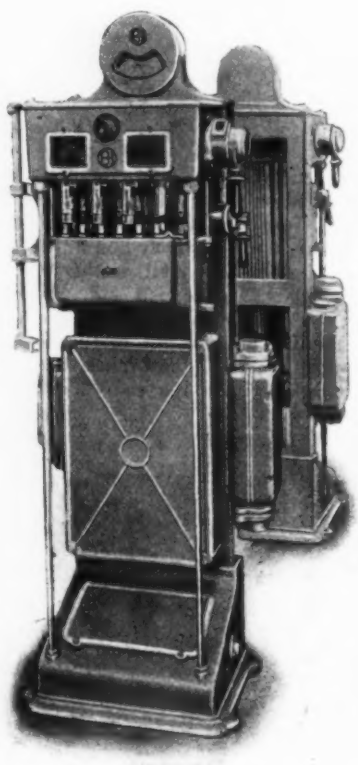


Fig. 1.

Variation in the speed of the driving motors is not a very important matter in most of the processes, as the quality of the product is governed by temperature, and the length and repetition of processes. Thus the only serious objection to the use of a.c. supply is removed, and the electric drive becomes a fairly simple problem in the selection and control of the right motors for the various working conditions.

Most of the motors will be required for handling the materials from one stage to another, the chief exception being the drive of the slicing machines for cutting the beets into small pieces preparatory to the extraction of their juice by diffusion. A slicing machine approximately 7 ft. in diameter, of the annular type (in which the beets are fed into a hopper so as to fall into an annular space where knives moving in a horizontal circle slice them across) will cut some 300 tons of beet in 24 hours, sufficient, that is, for about 35 tons of sugar. The starting duty of the slicing machine motors will, of course, be fairly heavy, so that wound-rotor motors are required and the starters should be of the step-by-step type with liberally rated starting resistances. Fig. 1 shows a suitable starter with a ratchet (step-by-step) handle suitable for operation by men having no electrical knowledge, the starting switches being of the multiple drop-switch type so as to give a quick certain movement on each step, without danger of breakdown by severe burning, such as might occur if a slowly moving contact arm were used. The drop-switch type stator circuit breaker is mounted in the same pillar, so that the whole forms a compact unit (with its own resistances) that can be set down in a convenient position without the necessity of making interconnections and interlocks on site.

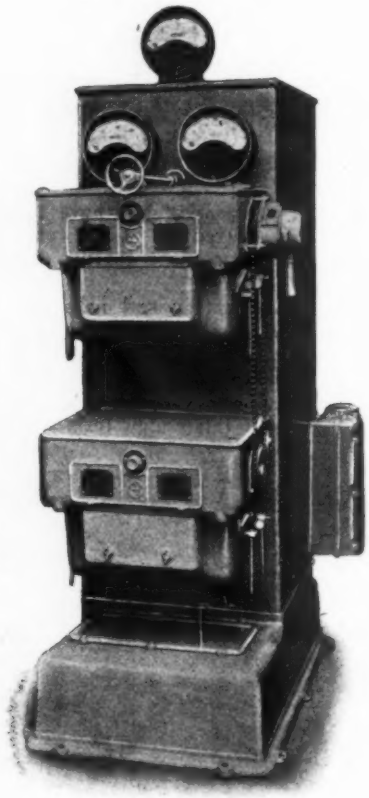


Fig. 2.

Alternatively, a synchronous motor may be used on the heaviest drive so as to keep up the power factor and improve the efficiency of the whole system. The motor will be started as a wound-rotor motor with a re-

sistance in the rotor circuit. When all the resistance has been cut out of circuit, the motor will be running at nearly synchronous speed (*i.e.*, with a small slip of, say, 5 per cent.). The rotor circuit is then opened again to superimpose on the rotor current an additional current from the exciter. The switchgear required will comprise a stator circuit breaker, a rotor starter, a change-over switch in the rotor exciter circuit and an exciter field regulator. The stator circuit breaker, which will be of the oil-immersed drop-switch type (with no-volt and overload releases), may be mounted with the change-over switch and the rotor starter in one pillar as shown in fig. 2, or for large motors, the rotor starter may be separated from the circuit breaker in another pillar. The liquid type of starter has also certain advantages for large isolated motors which it has not for the control of smaller motors. For large motors the liquid starter is comparatively small in size, easy to maintain (in large individual units), and gives a smooth start.

Having considered the power plant for the heaviest drives, and general questions of speed variation and load factor, the most suitable type of supply is practically settled.

Apart from the slicing-machine drives, the other motors are largely required for handling the product from process to process. The conveyors practically describe the sequence of processes, for the bulk of the material dealt with is such that mechanical handling is essential. Thus conveyors are required for bringing the raw beets to the washers (through which they are conveyed by spiral arms on a horizontal shaft.). Elevating conveyors are then needed for loading the slicing machines, which may be placed over the diffusers so that the slices can fall by gravity. In the next few processes the main product is in the form of a liquor, but the waste products—the fibrous residue of the beets from the diffusers (where the liquor is pressed from the beets), the carbonate of lime from the saturator (where the liquor is reduced to sugar in solution), and after evaporation and concentration the "char" or charcoal from the refiners require mechanical handling. Finally, the crystallised sugar from the vacuum pans must be removed, sorted, and packed, and the finished product dispatched.

For the various conveyors, auto-transformer starting will usually be the most satisfactory. The initial torque required to start heavy laden conveyors against considerable bearing friction is too great for satisfactory star-delta starting, and yet a squirrel-cage motor (protected by a well-designed starter in which the change-over cannot be made too soon), is sufficient without the added expense of a wound-rotor motor. A further safeguard is an overload restrainer which automatically lowers the overload cores, not right out of circuit, but sufficient to prevent the trips operating on the normal current peaks in switching to the "start" and "run" positions. In the case of long runs, where several conveyors must be used in series, an auxiliary contact can be fitted on each starter to energise the no-volt coil of the starter before it in sequence, so that no conveyor can be started unless the next conveyor is already in motion to remove the conveyed material.

Apart from solid materials, circulating pumps are required for passing the liquor from the beets through the saturators and filters, though the plant will no doubt be arranged to use gravity where possible. For some of these pumps wound-rotor motors may be required, especially where the lift is exceptional or the volume of stationary liquid to be set in motion is considerable. A suitable controller for the larger pump motors is shown in fig. 1, already described, but for smaller pumps up to, say, 10 h.p., a simpler type might be used to reduce the high cost of using a wound-rotor motor (where necessary), without diminishing the factor of safety. While some of the features that are advisable for protecting larger motors may be omitted or modified, the construction should be strong even in the case of those parts which are too often made of light material because they only carry small currents. For such small starters mechanical strength is of greater moment than electrical capacity. Especially in process work is it important that the small auxiliaries should be as sound a job as the larger plant.

Besides conveyors and pumps, a number of fans will be required for circulating air and gases. In the first place, CO_2 must be produced (by calcining limestone) and pumped into the saturators for treating the different liquors, to remove the lime as carbonate of lime. Then sulphurous acid gas is needed to decolourise the resulting juice from the lime filters, and after evaporation and concentration in vacuo, air fans are still required for drying the sugar. Star-delta starting can be used for the fans, but in some cases it is essential to have some means of altering the draught or air pressure. A good combination (to save the expense of wound-rotor motors with wasteful rotor resistances) is to use a two-speed motor in conjunction with a baffle in the air-pipes. These two-speed motors have two separate stator windings and a squirrel-cage rotor. When starting, the low-speed winding is switched on first (by straight-on, star-delta, or auto-transformer starting) and an extra switch is provided in the starter by which the high-speed winding is switched in (the low-speed winding being cut out by the same movement). By using the two speeds in connection with regulation of the baffle almost any required draught can be obtained economically.

A few other special drives are required, such as stirrers for the washing conveyors and melting pans, and of course the power plant auxiliaries are necessary if power is to be produced at the sugar works as suggested in the first paragraph.

Beet sugar manufacture does not differ very much from cane sugar manufacture. The yield per acre and the yield of sugar is now about the same (about 25 tons of beet or 3 tons of sugar per acre), and a large plant would deal with 1,000 tons of beet in 24 hours. The cane sugar factories have, of course, the advantage of cheap labour, but the beet sugar industry, with Government help, is now developing quickly in this country, and provides a new opening for business in electrical manufactures.

The writer is indebted for the photographs and some of the information in this article to Messrs. Brookhirst Switchgear, Ltd., of Chester, who are at present engaged on the manufacture of control gear for several of the new beet sugar factories being erected in this country.

High-pressure Transmission Masts.—Our German contemporary *Elektrotechnik und Maschinenbau* published in a recent issue an interesting article on the respective merits and costs of wood, steel, and ferro-concrete masts for the support of high-pressure transmission lines. The author considers that wooden masts are not suitable for lines working at a higher pressure than 35,000 volts, and even then are liable to cause interruptions. It is possible to get wooden masts that will carry lines working at higher pressures, but they are almost as costly as, and less durable than, steel or ferro-concrete masts. The author strongly favours the latter, and on the question of their durability, draws attention to the fact that they have been used for twenty years in France and for fifteen years in Austria. The only advantage, he considers, that can be put forward in favour of steel masts is that they can be taken down and rebuilt in new positions. This is, however, a convenience rarely required in connection with high-pressure lines.

Automatic Oil Purification.—Now that the principle of the employment of centrifugal separators on motor ships for the purification of fuel oil is becoming more generally recognised, interest is being centred in the details of the installation of such plant in order that the maximum efficiency and convenience of operation may be obtained. In this connection the arrangement which is being utilised on one of the new Holt Line motor ships now under construction at the Caledon yard illustrates the automatic operation of separators. The daily consumption of fuel oil will probably be in the neighbourhood of 13 tons, and this can be handled by one of the two De Laval machines working only a certain number of hours per day. According to the *Motor Ship*, the system is entirely enclosed, and is provided with an automatic controller, which not only regulates the maximum throughput, independent of the variable temperature of the oil, but also controls the head of pressure of the oil. The fuel is first passed through a coarse strainer, thence to the electrical heater, and finally to the purifier. The clean oil tank has an automatic float operating the regulating valve from the electric heater, and when closing it the electric current to the heater is switched off, thus preventing the oil from being overheated.

Electricity Supply in Great Britain.—I.

The Present Position with Regard to Statutory Powers.

Since the Electricity Commission was established in 1920 considerable progress has been made towards the accomplishment of its primary purpose—the reorganisation of electricity supply throughout the country; most of the Electricity Districts have been definitely delimited, and in some of them Joint Electricity Authorities or Advisory Boards have been set up, whose function it will be to ensure that further development shall be accelerated, with the ideal in view that every part of the country shall eventually be provided with a supply of electricity, generated and distributed on the most economical lines. The Commissioners have also granted a large number of Special Orders, supplementing the Provisional Orders and Acts of Parliament under which electricity is distributed and thus greatly extending the area covered by statutory powers.

There still remain, however, considerable areas over which no authorised undertakers have the right to supply electricity; many of these are more or less adequately catered for by companies or persons as yet unprovided with statutory powers, but for our present purpose, following the practice of the Electricity Commissioners, we shall regard these as "unoccupied areas," without prejudice to the possibility—in many cases the probability—that the unauthorised undertakers will eventually take steps to secure Special Orders and join the ranks of the elect. We propose to publish a series of maps showing the areas which are not yet covered by statutory powers, using for this purpose (by permission of the Controller of H.M. Stationery Office) the Ordnance Maps prepared for the Boundary Commission of 1917, which give the boundaries of county boroughs, rural and urban districts, and parishes. These maps, on a scale of 4 miles to one inch, can be got from Messrs. Edward Stanford, Ltd., price 6d. each.

The information on which the maps are based is to be found in the most convenient form in the Electricity Commissioners' volume of Returns of administrative particulars relating to authorised undertakers, published in January, 1925; but as these data are correct only up to the end of 1923, they have been supplemented with particulars contained in the Commissioners' Annual Reports, the *London Gazette*, and other publications obtainable from H.M. Stationery Office, bringing the information up to date. The map reproduced on the opposite page shows the various municipal boroughs, urban districts, rural districts and parishes contained in the Administrative Counties (divided by thick lines) of Bedford, Bucks, Northants, and Soke of Peterborough, together with the County Borough of Northampton. This area comprises 1,420,914 acres, and contained a population of 791,996 persons in 1921. The assessable value of the total area is approximately 4½ million pounds. As far as can be ascertained from the various available records, no statutory powers for the supply of electricity are held, nor has any application been made for them, in respect of the portions of the area shown on this map which have not been hatched.

The following is a list of authorised undertakers whose areas are wholly or partly included in the map:—

Local Authorities.

Aylesbury Corporation.
Bedford Corporation.
Luton Corporation.
Maidenhead Corporation.
Peterborough Corporation.
Kettering Urban District Council.

Companies.

Chesham Electric L. & P. Co., Ltd.
Cookham and District Electricity Corporation, Ltd.
First Garden City, Ltd.
Northampton Electric L. & P. Co., Ltd.
Rushden and District Electric Supply Co., Ltd.
Slough and Datchet Electric Supply Co., Ltd.
Uxbridge and District Electric Supply Co., Ltd.
Wellingborough Electric Supply Co., Ltd.
Windsor Electrical Installation Co., Ltd.

The Metropolitan Electric Supply Co., Ltd., possesses certain bulk supply powers under its Acts for parts of South Bucks—both shaded and unshaded.

Since this map was prepared by the Ordnance Survey Department in 1917, two new Urban Districts have been created, *viz.*, Wolverton and Burton Latimer.

It should also be noted that Hedsor Parish is now in Wycombe Rural District, and Wendover Parish has been transferred to Aylesbury Rural District; and a small part of the parish of Eton Wick has been transferred to Eton Urban District. Except for the above alterations, the map is topographically up to date in all respects. With the aid of such a map, the area entrusted to any particular undertaker can be readily traced out from a description of the area in words, except where the boundary line does not follow the various local government boundaries shown on the map, which is not very often the case. When all such areas have been shaded over, the areas that remain unoccupied can be readily described from the map, and any particulars regarding them that may be required can be ascertained from the census or other official publications.

It has been estimated that the possible number of consumers in the whole of the area shown on the map is well over 200,000, whereas the present number of consumers probably does not much exceed 20,000.

The above estimate of 200,000 is based on the figures given in the 1921 census, which shows the number of resident families to be over 190,000. In addition, in Table 10 of the Census the number of buildings not containing dwellings is given as over 10,000. These buildings include such places as offices, factories, warehouses, workshops, places of worship, and places of amusement.

In dealing with the areas of the various authorised undertakers, it is very important to be able to ascertain the relation in position and extent of undertaker A's area to undertaker B's area, &c. For this purpose it would be necessary to use a map of the whole country in order to make a complete survey of the situation. As such a map reproduced in our pages would be on too small a scale to be of practical use, it is proposed to deal with the respective counties on the largest practicable scale. The unoccupied areas are shown unshaded; those which are hatched are covered by statutory powers either granted or applied for (in the latter case, of course, the powers may be withheld).

The following details with regard to the existing undertakers have been extracted from the Electricity Commissioners' Returns:—

Luton.—Arrangements for mutual assistance have been entered into by Luton Corporation and the North Metropolitan Electric Power Supply Company, under Section 19 of the Electricity (Supply) Act, 1919; approved August 25th, 1922.

Uxbridge and District Electric Supply Co., Ltd.—Arrangements for mutual assistance have been entered into by the Uxbridge Company and the Metropolitan Electric Supply Co., Ltd., under Section 19; approved November 22nd, 1923.

Northampton Electric Light and Power Co., Ltd.—Arrangements for mutual assistance have been entered into by the Northampton, Wellingborough, and Rushden and District Companies, under Section 19. Also the Northampton Company has been authorised by the Northampton, Wellingborough and Rushden Electricity (Bulk Supply) Special Order, 1922, to break up certain streets outside the respective areas of supply of the three companies.

Engineering and financial data relating to the authorised undertakers mentioned above can be obtained from the Electricity Commissioners' Return—"Electricity Supply"—published in June, 1925.

Electricity Supply in the Counties of Bedfordshire, Buckinghamshire, and Northamptonshire.

Practical Nomography.

How to Make and Use Nomograms.

By REGINALD O. KAPP, B.Sc., A.M.I.E.E.

The graphical representation of a law, known as a nomogram or alignment chart, is fascinating. The connection between the lines and scales on the chart and the often complicated mathematical concepts represented is so far from obvious that such charts must appear astonishing to the uninitiated and not far short of black magic to the non-mathematician. One might think that great ingenuity was required to devise a graph which would correctly interpret a mathematical formula involving a diversity of functions of several variables. And yet the geometry on which this branch of graphical representation is based is quite elementary.

It is possibly the apparent difficulties of the subject that have prevented this aid to practical engineering from being more universally employed, although it was invented by M. d'Ocaigne many years ago.

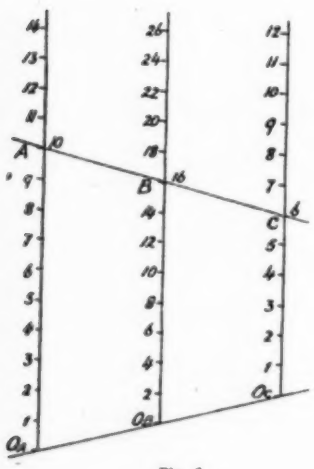


Fig. 1.

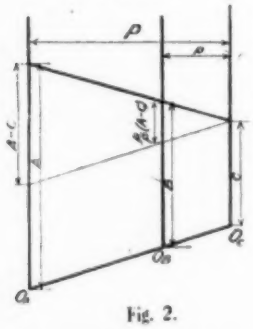


Fig. 2.

Parallel Straight Lines.

The three parallel lines in fig. 1 are equally spaced and therefore:

$$O_A A + O_C C = 2\, O_B B,$$

wherever the straight line A B C is placed.

If scales are drawn on the three lines the zero point of each being at O_A, O_B, O_C respectively, and if the scale divisions on the B line are placed at half the distance from each other to those on the other two lines, and if O_A, O_B, O_C all lie on one straight line, then any straight line must cut the three lines at such scale divisions A B and C that we can read off the diagram scale divisions to solve the equation:

$$A + C = B, \text{ or put in another form,}$$

$$A - B + C = 0 \qquad (1)$$

Thus fig. 1 is a nomogram for the above simple formula.

The three quantities A, B and C may each be a function of one of three independent variables. In this case the scales on the A, B and C lines must be so-called functional scales. A functional scale is one on which the distance of each scale division from the zero point is proportional to the function of the variable. We *measure* a distance corresponding to the *function* of the variable and *write* against the point thus obtained the value of the variable itself. Functional scales familiar to engineers are those contained on the slide rule in which the function is the logarithm of the numbers marked on the scale. As an example, consider the expression for the moment of resistance of a rectangular beam:

$$R = bh^2/6$$

This can be written: $\log R - 2 \log h - \log b/6 = 0$.

In this form the resemblance to expression (1) above becomes apparent if we write $\log R = A$, $2 \log h = B$, $-\log b/6 = C$. If we *measure* on the left hand or A line values of (log R) and *write* the corresponding values of R against the measured points, making the point where $\log R = 0$ coincide with O_A, we have a functional scale of log R. Similarly we can mark off a functional scale of $(-\log b/6)$ on the right hand or C line. The point for which $(-\log b/6) = 0$ must coincide with O_C. At this point $b = 6$. This is the same thing as operating a slide rule so that the 6 on the slider is opposite the 1 on the fixed portion. The 6 causes the scale to be shifted, but has no influence on the distances between scale divisions, which must be the same as on the scale of R. The function being negative, increasing values of b involve decreasing values of the function so the scale runs in the opposite direction from the scale of R. On the middle or B line we mark a functional scale of $(2 \log h)$. The distance to be measured between corresponding scale divisions would be half as great on this scale as on the two outer scales if the function were $\log h$. As the function is $2 \log h$, the distance between scale markings is the same on the middle scale of h as it is on the two outer scales. The point at which $2 \log h = 0$ or $h = 1$ must coincide with point O_B.

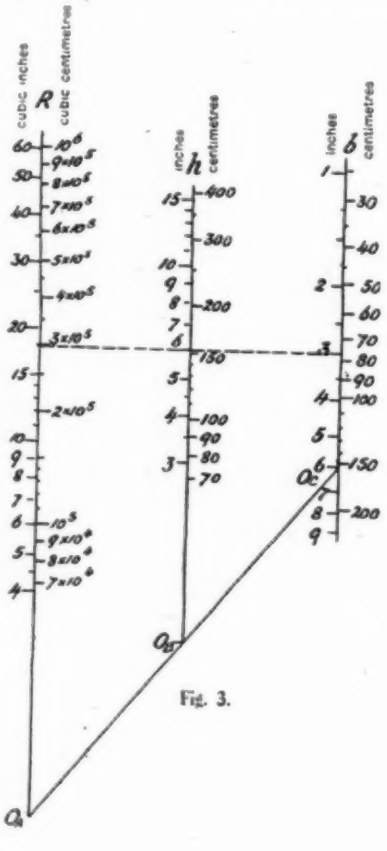


Fig. 3.

It suffices now to choose the slope of the line O_A, O_B, O_C so that the useful values of R, h and b lie conveniently on our paper. Suppose we wish to construct a chart for cases where h varies between 3 in. and 15 in. and b varies between 1 in. and 9 in. Our tie line O_A, O_B, O_C must slope rather steeply as shown in fig. 3. To avoid this difficulty we can choose some other example as a tie line corresponding to more useful values of our variables. Such an alternative tie line is shown dotted in fig. 3, and if this is used, there is no need to extend the scales to their zero points.

It is useful that each line has two sides to it so that one side can be used for one kind of unit and the other side for another kind of unit. Thus fig. 3 has been constructed in inches, but corresponding values in cm. have been added on one side of each line. When this is done a nomogram may save a great deal of arithmetic in the conversion of units.

Figs. 1 and 3 show the correct type for any expression containing three independent variables which can be got into the form of equation 1. One variable must occur only in A, another variable only in B, and the third variable only in C. In each case the function of the variable may be simple or complicated; the chart will always have the same simple form.

A large number of expressions involve only multiplication and division of the variables or simple powers of them, and all these are easily got into the form of equation 1 by taking logs, and the graphs will contain simple logarithmic scales. Every engineer carries at least two logarithmic scales about with him, unit length being exactly half as much on one as on the other. These

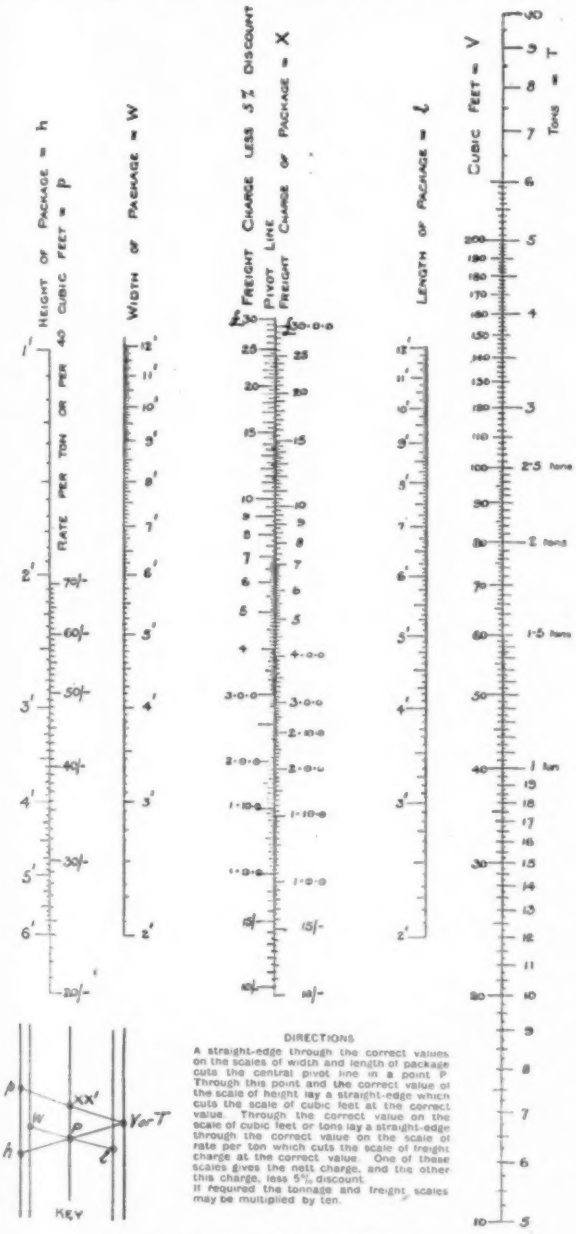

HEIGHT OF PACKAGE = h
RATE PER TON OR PER 40 CUBIC FEET = P
WIDTH OF PACKAGE = W
FREIGHT CHARGE LESS 5% DISCOUNT
PIVOT LINE
FREIGHT CHARGE OF PACKAGE = X
LENGTH OF PACKAGE = l
CUBIC FEET = V
Tons
DIRECTIONS
A straight-edge through the correct values on the scales of width and length of package cuts the central pivot line in a point P. Through this point and the correct value of the scale of height lay a straight-edge which cuts the scale of cubic feet at the correct value. Through the correct value on the scale of cubic feet or tons lay a straight-edge through the correct value on the scale of rate per ton which cuts the scale of freight charge at the correct value. One of these scales gives the nett charge, and the other this charge, less 5% discount. If required the tonnage and freight scales may be multiplied by ten.
KEY

Fig. 4.—Nomogram for Freight Charges.

are the long and the short scales on his slide rule, and these suffice for a great number of graphs. In fig. 3 only one of these scales is needed.

A rule is useful to decide whether increasing values of the function are to be plotted upwards or downwards. A glance at equation 1 gives the rule. For this equation increasing values of all the three functions are measured in the same direction, and the sign of each term is opposite to the sign of the terms next to it. So we may say that *if two successive terms are of opposite signs, the scales are measured in the same direction; if two successive terms are of the same sign, the scales are measured in opposite directions.*

Unequal Spacing of Lines.

We have so far only considered cases where the three parallel lines are equally spaced. If they are not equally spaced and the distance of the B line from the C line is p and the distance between the A and C lines is P, fig. 2 shows that—

$$B = C + p/P \times (A - C).$$

It will be easily found that—

$$A - B \times P/p + (P/p - 1)\ C = 0 \quad \ldots\ldots\ldots\ldots\ldots\ldots (2)$$

This means that the scale divisions must be so spaced that if unit length represents one unit of the function A, p/P unit lengths will represent one unit of function B, and $p/(P-p)$ unit lengths will represent one unit of function C.

Unequal spacing is useful in exceptional cases; for instance, if the expression to be represented contains various higher powers of the variables, particularly if these differ by one. It may then be possible to use the same logarithmic scale for all three lines. Unless there are good reasons for it, unequal spacing should be avoided. A nomogram in which the spacing of the lines and the choice of unit length on the scales are arbitrary is needlessly tedious to construct, and looks amateurish when finished. It suggests that the designer set about his task with no clear idea of what he was doing. *When the scales are logarithmic, the advantage of being able to use the available scales on the slide rule should never be lost sight of.*

More than Three Variables.

So far we have only considered expressions containing three independent variables. For the case involving more variables, we will choose as an example the calculation of freight charges from the weight and dimensions of a packing case.

The cubic contents of the three dimensions denoting length, height and width are:—

$$\text{cubic feet} = V = h \times l \times w$$

$$\text{or } \log V - \log h - \log l - \log w = 0,$$

which can be arranged in some convenient way so that any two terms are on one side of the equation sign and are equated to a value which we will call K. For instance—

$$\log V - \log h = \log l + \log w = K$$

so that we get two separate equations—

$$-\log h - K + \log V = 0$$

$$\log w - K + \log l = 0.$$

Each of these expressions can form a separate chart for three variables. If we elect to make the scale run upwards for increasing values of a positive function, the scale of h must run downwards. Applying our rule, the scale of K must run upwards, as the sign is the same as that of the function of h. As the sign of the last term is opposite to the sign of the K term, the scales of these two run the same way so that the V scale must run upwards. The long scale of the slide rule can be used for both h and V. As we are not interested in the values of K, it is not necessary to write any figures on this scale. A blank line suffices. For the second chart, the scale of w runs upwards, that of K also runs upwards as before, and that of l must run upwards. If the choice of unit length on all scales is consistent, which holds in this case if the same slide rule scale is used for each, we can superimpose the two K lines. The single K line thus formed is called a pivot line.

The charge for a given package

$$X = p \times V/40$$

if p is the charge for 40 cb. ft. or one shipping ton.

This can be written—

$$\log (p/40) - \log X + \log (V) = 0$$

Applying our convention, all the scales increase upwards, and as the scale of V previously found also increased upwards, the new nomogram can be superimposed on the one giving V so that the values for V coincide. The same slide rule scale can be used again. To reduce the number of lines, the distances should be so chosen that the X line coincides with the K line already constructed, and we get a complete chart as in fig. 4. A second scale on the V line gives shipping tons corresponding to volume and a second scale on X gives costs where 5 per cent. discount is allowed. A glance at a

slide rule will make it clear that this second scale of x is the first scale moved so that the .95 mark on one comes opposite the unity mark on the other.

Charts with Slanti g Lines.

We now come to consider another type of alignment chart based on equally simple but somewhat different geometry.

On fig. 5 we have the relationship $A/B=p/q$. The apex of the two similar triangles can have any position on the line O_A, O_B, giving different values of p/q. Put $p/q=C$ and we can write values of C along line O_A, O_B. We have then a chart solving the expression

$$A/B=C \quad \ldots\ldots(3)$$

and as before A, B and C may be any function of three independent variables, and the scales A and B functional scales. C is also a functional scale, but of a more complicated nature. The correct points can be calculated,

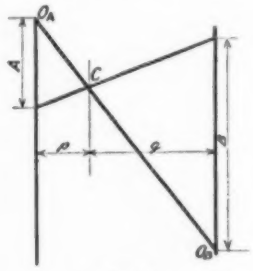


Fig. 5.

but it is generally simpler to construct all values of C point for point. Assume a convenient value of B such as 1 or 5 or 10. Then A=C or 5C or 10C, as the case may be. A series of lines through the selected value of B and successive points on A cuts the C line in points corresponding to easily calculated values. It will be readily seen that the same relationship holds if the values of C are placed on the C line produced beyond O_A. This gives a more extended scale of C, and is therefore sometimes of advantage.

In the simplest form of equation (3), it is better to turn the expression into the form of equation (1) by taking logs. But sometimes one of the functions is not

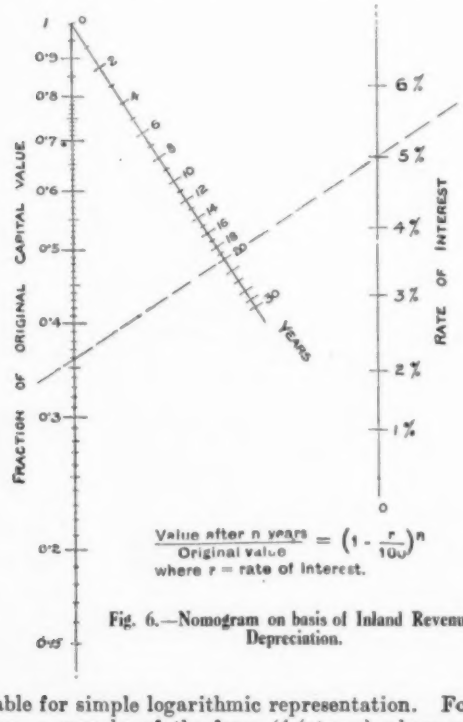


Fig. 6.—Nomogram on basis of Inland Revenue Depreciation.

suitable for simple logarithmic representation. For instance, A may be of the form $(f(a)+m)$ where m is a constant, and then the form indicated by fig. 5 is the easiest and quickest to construct. An example of this type of chart is shown on fig. 6. If p is the fraction of original capital value after n years, r the rate of interest—

$$p=(1-r/100)^n.$$

Taking logs,

$$\log p/\log(1-r/100)=n,$$

which is of the form shown in equation (3).

By taking logs a second time, a chart as given by equation (1) could be constructed instead.

(To be concluded.)

Reviews.

Alternating Currents and Transients. By F. M. Colebrook, B.Sc., &c. Pp. 195; 97 figs. London: McGraw Hill Publishing Co., Ltd. Price 15s. net.

In this volume, the author treats the theory of alternating currents by the well-known rotating-vector or symbolic method, and the book is apparently the outcome of a desire to co-ordinate the nomenclatures of pure vector analysis and the rotating-vector method of treating a.c. theory, and to simplify the interpretation of the symbolic operator j. As a matter of fact we have never found any particular difficulty in comprehending the meaning and function of j, and we do not think that the author has succeeded in making clearer what already offers little difficulty. In this treatment, the author endeavours to counteract the interpretation of the symbolic operator j as an "imaginary" quantity, and instead he pleads for the simple understanding that "the symbol j . . . rotates a vector through 90 deg. in a certain defined direction. . . ." We do not know of any other interpretation to be placed upon it!

Chapter I opens with vector definitions and proceeds immediately to introduce the operator j. The principles of vector addition and subtraction are then indicated and the study of j proceeds on more advanced lines. The author indicates the distinction to be drawn between vectors and operators, and the chapter concludes with graphical calculations employing both of these. The triangle of fig. 11 should be lettered A.B.C. in order to accord with the text, and in the line immediately below this figure, v should be a_v.

Chapter II treats of the scalar product of vectors, and the point of chief interest lies in the indication that transferring the operator j from one member of a scalar product to the other does not alter the magnitude of the product, but it reverses the sign. This is a useful rule to remember.

Variable vectors are dealt with in Chapter III, and the calculus is here employed for the first time in the volume.

Chapter IV enlarges upon the vector analysis of alternating currents, and very clear diagrammatic representations are given illustrating Kirchhoff's laws. The author then proceeds to a vectorial study of simple circuits containing resistance, inductance, or capacitance, and thence to compound series and parallel circuits containing more than one of these characteristics. We think it is regrettable that the author has not indicated by arrows, the assumed directions of rotation of the vector systems, and we deplore the settings of figs. 30, 31, 32, 33 and 34, the pairings of which are incongruous. We should much prefer to see the use of the word capacitance to capacity; it is more euphonious in our opinion, and in better harmony with inductance. We see that on p. 43 the author uses the conception of a "charge on the plates" of a capacitance, but we prefer Steinmetz's dictum that there is obviously no more sense in thinking of current as charging the capacitance with a quantity of electricity than of voltage as charging an inductance with a quantity of magnetism. The latter idea has been discarded long ago, so why not let the former also die a natural death? The subsequent treatment deals with inductively coupled circuits, which include transformer and a.c. bridge circuits.

Chapter V bears particularly upon the problems arising in the theory of the action of telegraph or telephone cables. The application of hyperbolic functions to the determination of current and potential distribution in telephone and telegraph cables is given, and the chapter concludes with a short treatment of stationary waves on wires.

Chapter VI includes a vectorial treatment of damped electric oscillations, and the theory of the generation of continuous oscillations by means of the thermionic valve is given. Free oscillations in magnetically coupled circuits are dealt with at greater length.

Chapter VII is concerned with the application of vector analysis to the theory of irregular a.c. waves and it very pertinently brings to the fore the fact, which is not always appreciated in practice, that if a non-sinusoidal e.m.f. wave is applied to an inductance, the current harmonics are smaller in amplitude than the corresponding pressure harmonics; the ratio of the nth current harmonic to the fundamental, for instance, is only $1/n$th of the ratio of the corresponding e.m.f. terms. In the case of capacitance, however, the opposite is the case and the current harmonics are greater in amplitude than the corresponding pressure harmonics; the ratio of the nth current harmonic to the fundamental is n times the ratio of the corresponding e.m.f. terms. These features are of very considerable importance in the testing of high-pressure cables.

Chapter VIII studies the current and pressure relationships in unloaded and loaded three-phase star and delta connected systems. The power supplied by three-phase systems and the three-wattmeter and two-wattmeter methods of power measurement are discussed. The two-wattmeter method of determining the power factor of a balanced three-wire star connected load is given, and a brief reference to the general theory of symmetrical polyphase systems of e.m.f.'s of any wave form concludes the chapter.

The usual series of examples and answers is given after each chapter for the benefit of students.

The author generously gives a bibliography of twenty-four publications dealing with the subject matter of his book, which those interested will recognise as containing most of the best and really useful works upon the subjects.

The illustrations are excellently clear and well reproduced, and the general make-up of the volume is a credit to the publishers. A useful summary of contents is given at the front of the volume and a subject-matter index at the end.

We think the title of the work might have been chosen more carefully, as far too little attention has been given to the study of transients to warrant the inclusion of that term in the descriptive sense adopted.

The Induction Motor. By H. VICKERS. Pp. ix+332; figs. 151. London: Sir I. Pitman & Sons, Ltd. Price 21s. net.

At the present day it cannot be expected that any new book on the induction motor can bring with it a large amount of new matter; and in the preface the author admits that "he is deeply conscious of his great debt to various writers." Indeed, it would not be too much to say that the free use that has been made of the writings of such authorities as Steinmetz, Walker, Kloss, Smith, and others, gives to the book much of its utility. In addition, Dr. Vickers has the advantage of personal experience in the design of induction motors. The book thus represents a useful compendium of present knowledge and practice on the theory and calculation of induction motors. The subject matter is somewhat wider than the mere title implies, but the treatment is often scanty.

With all deference to American writers, we do not like the expression of torque in synchronous watts. In our opinion the author has not in the first chapter carried out his claim in the preface to have rendered due acknowledgment to sources upon which he has drawn, while some diagrams have not been copied correctly. The cross-field method has been chosen in preference to the rotary-field method in the treatment of the single-phase induction motor. Chapter III is headed "Starting devices for single-phase motors"; but after two pages the author makes a startling digression into the action of the induction generator, while the tail-end of the latter subject appears to have monopolised the succeeding chapter. Credit can be given to the author for his work in the chapter on electric braking.

The induction motor as phase converter deserves more than the two pages it receives. Speed control is treated at great length—in particular the rheostatic and pole-changing methods. The author's close connection with Mr. Hunt may serve to explain the long account of the motor bearing this name, but we are surprised to find that so little has been made by him of the ingenious device due to Mr. Creedy, wherein the speed change is effected by altering the number of phases.

As is to be expected, phase advancing and the induction-type synchronous motor find a place in a modern treatise on the induction motor, but we could have wished that they had received less cursory treatment. Windings are dealt with satisfactorily in a modern manner, though the three coloured plates referred to appear for some unexplained reason in the middle of the chapter on starting devices. The remaining chapters devoted to design should prove of value to the student.

Greater care should have been spent on the revision of the proofs, while some of the German references would defy even experts at solving puzzles.

Telephone Communication. By CHARLES ALLEN WRIGHT and ALBERT FREDERICK PUCKSTEIN. Pp. xviii+515; figs. 294. London: McGraw-Hill Publishing Co., Ltd. Price 25s. net.

This volume is mainly devoted to telephone communication at what the authors call medium-frequency, in order to distinguish it from wire telegraphy and radio telephony, the frequencies of which lie outside. This medium band of frequencies lies within the limits of 50 and 6,000 cycles per second. Principally, however, the work deals with the causes that produce attenuation and distortion of speech, and the means of minimising them.

The work is sub-divided into four parts, dealing respectively with (*a*) The general discussion of the telephone problem; (*b*) Telephone apparatus and lines; (*c*) Recent developments in telephone communication, and (*d*) The maintenance of telephone plant. These are followed by an appendix on the electrical fundamentals which apply directly to medium-frequency apparatus and lines.

Much of the ground covered by this work has already been fully treated in several English manuals, but the reader who is particularly interested in the mathematical treatment of telephone problems will find here all the essential material required to enable him to calculate those quantities which enter into the phenomena of telephone transmission. The practical side of telephony receives a fair amount of attention, *e.g.*, the construction of loading coils, relays, cables, valves, &c., &c.

The chapters on multiplex or carrier-current telephony and radio-telephony are up to date, but the Austin-Cohen formula for the received radio current must be accepted with reserve in view of recent experiments in this direction.

Under "Maintenance of Apparatus and Circuits," simple tests for resistance and the localisation of faults are given and these are followed by descriptions of methods for the measurement of alternating currents, potentials, frequencies, phase shifts, and attenuation.

It is a pity that the authors dismiss so important a machine as the Franke alternator in the brief space of eleven lines in view of its importance in alternating current measurements. A diagram showing its principle, and a somewhat more extended treatment of its operation, would be distinctly useful.

The chapter on "Electrical Fundamentals" is a convenient summary of the various formulæ met with in electro-technics, followed by a brief explanation of vectors and hyperbolic functions.

Each chapter is followed by sets of questions and problems, as also by a bibliography of books which it is recommended should be read in connection therewith. A series of laboratory exercises forms a final appendix.

Although an American manual, having its distinctive transatlantic expressions, the British reader will find much useful information within its pages.

Business Notes.

Commercial and Industrial Developments, Business Changes, Trade Opportunities New Publicity Literature, Liquidations and Failures.

A Shopping Week.—In connection with Dewsbury shopping week, which opened on October 3rd, the Electricity Committee of the Corporation supplied illuminated signs for the Town Hall; tramway standards and electric street lamps were decorated; and the Yorkshire (Woollen District) Tramways Company and the Ossett & Soothill Nether Tramways Company each supplied a decorated and brilliantly illuminated tramcar for touring the surrounding districts to advertise the "week."

E.D.A. Activities.—On Saturday last about 60 newspapers in all parts of the country contained an apposite advertisement drawn up by the British Electrical Development Association drawing attention to the end of "Summer time" and the approach of the lighting and heating season. The keynote of the advertisement was "Light, warmth, and comfort in one word—Electricity."

An "Exide" Window-dressing Competition.—A window-dressing competition in connection with "Exide" batteries was recently organised by the Chloride Electrical Storage Co., Ltd., and over 1,400 entries were received. The judges, who were editors of the automobile and radio Press, awarded the first prize (20 guineas) to the Negus Electrical Co., Cambridge. The second (10 guineas) and third (5 guineas) prizes were awarded to Mann, Egerton & Co., Ltd., Norwich, and J. Tee and Co., East Finchley, respectively.

Window-lighting Competition.—MESSRS. W. P. HOLT AND CO., electrical contractors, Bradford, are to be congratulated on the fact that the electrical installations at the shops of Madame Eda (modiste), Bridge Street, and Mr. J. Walton (confectioner), Victoria Square, which won the first prizes in two sections of the window-lighting competition in the recent Bradford Shopping Week, were put in by them twelve months ago, and were not altered in any way for the competition.

Works Visit.—Last month a party of members of the East Kent branch of the Electrical Contractors' Association paid a visit to the Cosmos Lamp Works (Metro-Vick Supplies, Ltd.), Brimsdown. The journey was made by charabanc and upon the return a break was made to allow the party to inspect the company's London showrooms.

Catalogues Wanted for Australia.—The Australian Commonwealth Engineering Standards Association is establishing a valuable collection of trade catalogues and similar commercial material in connection with its library, which, with the very extensive library of the Institution of Engineers, Australia, is available for the use of members of both organisations. The engineer-secretary, Mr. W. R. Hebblewhite, of Macleay House, 16, College Street, Sydney, asks us to bring the matter to the notice of British manufacturers, in order that the Association may be placed on their mailing lists for the receipt of their publications.

Lead.—Messrs. James Forster & Co., in their lead market report of October 3rd, say: "Closing prices yesterday were £39 15s. for October and £37 5s. for January, a rise on the week of 30s. and 25s. respectively. Since September 21st, when the price touched £40 10s., consumers have not been much in evidence, but it was certain that, with the present acute shortage, prices would advance again when buying was renewed. The shipping strike is dislocating supplies and its effect will be felt for many months to come. On the other hand, consumption shows signs of decreasing both here and on the Continent owing to the high price, and lead is arriving in London from France, Germany and Belgium. Under present conditions the price is likely to go higher yet."

Electrical Commercial Travellers.—The following events are included in the programme of the Electrical Trades Commercial Travellers' Association, to which we briefly referred in our last issue:—

October 10th.—Bohemian Concert, Manchester Hotel, 7.30 p.m.

October 30th.—Lecture by Mr. V. Dale on "Salesmanship," at E.L.M.A. Rooms, at 7 p.m.

November 13th.—Annual General Meeting, St. Bride's Institute.

November 21st.—Whist Drive and Social, Manchester Hotel, 7.30 p.m.

January 15th, 1926.—Lecture Demonstration on "Lighting," by Mr. W. E. Bush, at E.L.M.A. Bureau, at 7 p.m.

February 13th.—First Annual Dinner, Manchester Hotel, 6.30 p.m.

March 20th.—Grand Carnival Dance, Manchester Hotel, 7.30 p.m.

For Sale.—Lincoln Corporation Electricity Committee invites offers for one 750-kW Willans-Westinghouse turbo-alternator and exciter, also a quantity of steam valves. Mr. H. J. Shaw will sell by auction on October 27th, at 85, Newington Causeway, a stock of electrical and wireless goods, &c. (See our advertisement pages to-day.)

Trade Announcements.—The Macintosh Cable Co., Ltd., have moved to larger premises at 241a, West George Street, Glasgow. Telephone No.: "Central 7278"; Telegrams: "Cablamac."

The telephone numbers of Messrs. Everett, Edgcumbe and Co., Ltd., Colindale Works, Hendon, have been altered to "Colindale 6045 and 6046." The firm's London office telephone numbers will remain unaltered, *viz.*: "Victoria 3020 and 3021."

Iron & Nickel Battery Co., Ltd., have removed to 17-19, Cockspur Street, Pall Mall, S.W. Telephone: Regent 7187.

Runbaken Magneto & Accessory Co. state that all communications, parcels, &c., intended for the Runbaken Magneto Co., Ltd., should be addressed to 270, Deansgate, Manchester, and not elsewhere, as their former branch depôts have been closed down.

On September 30th Mr. M. W. Woods removed his London offices and showrooms to larger premises at 3, Denman Street, London Bridge, S.E.1. Telephone number: Hop 6966/7.

Mr. J. Carman, electrician and wireless engineer, of 65, King Street, Ramsgate, is opening a branch business at Broadstairs.

Mr. J. E. Dawson, radio engineer, has opened new showroom premises in High Street, Boston.

Messrs. S. Evans & Sons, electrical and wireless specialists, have opened premises at 16a and 18, King Street, Maidenhead.

Catalogues and Lists.—Mr. F. Turner, 61-63, Summer Hill, Birmingham.—An illustrated leaflet containing details and prices of art metal fire surrounds, curbs, &c.

Marconi's Wireless Telegraph Co., Ltd., Marconi House, Strand, W.C.2.—Leaflet No. 1052, containing an illustrated description of the company's 100-W "Type Q" broadcast transmitting equipment.

Messrs. Crompton & Co., Ltd., Chelmsford.—Descriptive List No. 607, dealing with auto-synchronous motors and their applications, particularly in the improvement of power factor.

Brookhirst Switchgear, Ltd., Northgate Works, Chester.—Calendar cards for October, November and December, bearing views of Chester.

The British Thomson-Houston Co., Ltd., Mazda House, Newman Street, Oxford Street, W.1.—An illustrated pamphlet dealing with the "Trojanette" kitchen-lighting unit, and a blotter advertising "Mazda" lamps.

Mr. O. N. Beck, 11, Queen Victoria Street, E.C.4.—An illustrated pamphlet describing the "Opifex" water-level communicator for boilers.

Metropolitan-Vickers Electrical Co., Ltd., Trafford Park, Manchester.—Leaflets Nos. 18/1-1, describing the company's d.c. mill motors; and 17/1-1A and 17/1-1D, dealing with the "X" type d.c. commutating-pole motor. Fully illustrated.

Metro-Vick Supplies, Ltd., Trafford Park, Manchester.—A series of illustrated pamphlets dealing with the "Cosmos" three- and five-valve sets, crystal set, and valves.

The Mulford Wireless Service Co., Ltd., Nightingale Lane, Balham, S.W.12.—A showcard indicating which of the radio valves on the market possess similar characteristics. Also an identification "tally" for the use of those who charge accumulators in quantity.

Rotocrete, Ltd., 11 and 12, Windsor House, Victoria Street, S.W.1.—Three pamphlets describing the "Rotocrete" beam system of building construction.

The General Electric Co., Ltd., Magnet House, Kingsway, W.C.2.—A pamphlet entitled "The Secret of Better Home Lighting," describing the company's domestic lighting fittings and lamps. The "Osram Bulletin" for October, advertising "Osram" lamps and valves.

The Cambridge Instrument Co., Ltd., 45, Grosvenor Place, S.W.1.—An illustrated postcard depicting CO_2 and CO content measuring instruments.

Attaix, Ltd., 36, Bernard Street, Southampton.—Two leaflets illustrating and describing the "Chargeless" high-low tension supplier and the "Adaptolite" four-valve wireless set.

Mr. W. S. Johnson, 42, George Street (first floor), Edinburgh.—A leaflet illustrating and describing a cordless electric iron.

Messrs. Alan Wright, Sentinel House, Southampton Row, W.C.1.—An illustrated and priced folder advertising "Inventum" electric fires.

Tungstalite, Ltd., 47, Farringdon Road, E.C.1.—An illustrated folder dealing with "Tungstalite" lamps, and a price list of cables, conduit, lampholders, switches, &c.

Igranic Electric Co., Ltd., 149, Queen Victoria Street, E.C.4.—An illustrated pamphlet describing the "Igranic" supersonic heterodyne receiver outfit, and a priced leaflet of component parts for radio purposes.

Messrs. Simpson, Baker & Co., 2-5, Nelson Street, Bristol.—A booklet showing radio receiving sets, loud speakers, valves, and other component parts. Illustrated and priced.

Messrs. Etablissements Merlin et Gerin, Grenoble, France.—An illustrated catalogue, describing various types of transformer pillars for tapping overhead high-pressure transmission lines.

Messrs. Hunter & Jack, 38, Elliot Street, Cranstonhill, Glasgow.—A price list of "B.I." lamps.

Swedish General Electric, Ltd., 5, Chancery Lane, W.C.2.—Stock list No. 116, containing particulars and prices of a.c. motors and d.c. motors and generators available for immediate delivery. Also pamphlet No. 102, dealing with motors and machinery for the printing trade.

The Jackson Electric Stove Co., Ltd., 143, Sloane Street, S.W.1.—October blotter bearing an illustration of the "No. 586" fire.

Siemens & English Electric Lamp Co., Ltd., 38-39, Upper Thames Street, E.C.4.—A leaflet bearing illustrations of the showcards, signs, posters, &c., produced in connection with the company's lighting "campaign." Also monthly price list for October.

Messrs. Cole, Marchent & Morley, Ltd., Bradford.—An illustrated pamphlet describing the company's heat-extraction steam engines.

Messrs. Birkbys, Liversedge, Yorks.—A mailing card showing a transformer tapping switch for 200 A at 50,000 V (max.), moulded in "Elo" insulating material.

Messrs. J. Hopkinson & Co., Ltd., Britannia Works, Huddersfield.—Illustrated list (No. 1850) particularising their "Mac" valves.

Messrs. Higgs Motors, Witton, Birmingham.—October stock list of motors, announcing a.c. price reductions.

Messrs. Herbert Morris, Ltd., Loughborough.—32-page illustrated pamphlet relating to their hand overhead cranes.

Messrs. Tok Switches, Ltd., Granville House, Arundel Street, London, W.C.2.—Blotter for October.

Bankruptcy Proceedings.—F. A. Fraser, electrical engineer, 33, Tothill Street, Westminster, S.W.1.—This debtor attended on September 29th before Mr. Registrar Francke, at the London Bankruptcy Court, for public examination upon accounts showing unsecured debts of £806; a partly secured debt £2,500 (security valued at £800), assets "nil," and a deficiency estimated at £2,506. Replying to Mr. Vyvyan, Assistant Official Receiver, the debtor stated that in addition to being an electrical engineer he had acted as director to several limited companies. Among the number was the Electrical Contract and Maintenance Co., Ltd.; that concern went into liquidation in 1924, but was succeeded by the Electrical Contract and Maintenance Company (1925), Ltd., which was still in existence. Whilst a director of the old company he guaranteed an advertising account owing to Messrs. Sells, Ltd., who had obtained judgment against the company for £326; they agreed to refrain from proceeding under the judgment in consideration of witness guaranteeing the payment; a sum of £150 was paid before the company went into liquidation, but Sells, Ltd., thereupon proceeded against witness for the balance, obtained judgment for £186, and instituted bankruptcy proceedings. At the time of giving this guarantee witness held 2,000 shares in the company. In October, 1919, he assisted in the formation of R.J. Corporation, to which Messrs. Cox, the bankers, advanced £13,000 on the security of debentures and the joint and several guarantees of the four directors. That company went into liquidation in 1921; Messrs. Cox realised £3,000 in respect of the debt, and the four directors became responsible for £2,000 each in respect of the balance. Witness had returned his guarantee as the partly secured debt of £2,500, the security being a reversion which he had valued at £800. The debtor attributed his insolvency to the failure of companies in which he had been interested and to his liability under the before-mentioned guarantees. The examination was concluded.

W. J. Lattimer (Lattimer & Co.), electrical engineer, 52, High Street, Croydon.—Receiving order made September 24th, on creditor's petition. First meeting October 14th, at 29, Russell Square, W.C. Public examination November 23rd, at the County Court, Croydon.

J. S. McLeod (McLeod Bros.), radio and electrical engineer, 189, Blackburn Road, Bolton, and also with a partner as

McLeod Bros., at 55, Chorley New Road, Horwich.—First and final dividend of 3s. 10½d. in the £, payable at the offices of Messrs. H. L. Price & Co., 47, Mosley Street, Manchester.

C. WRIGHT and H. T. WRIGHT, electrical engineers, 251, Fulham Road, S.W.—Trustee, Mr. W. Strachan, 50, Gresham Street, E.C., released August 25th.

S. H. BARDWELL (Bennett, Bardwell & Co.), electrical engineer, 22, Church Street, Basingstoke.—Receiving order made September 24th, on debtor's own petition.

T. ROBERTS and J. TAYLOR (Roberts & Co.), electrical engineers, 61, Old Town Street, Plymouth, and Fore Street, East Looe.—Trustee, Mr. F. West, appointed September 26th.

J. ISHERWOOD, wireless and photographic dealer, 91, Lee Lane, Horwich.—First and final dividend of 2½d. in the £, payable at the Official Receiver's offices, Byrom Street, Manchester.

J. B. SHIELDS, plumber and electrician, 221 & 198a, Linthorpe Road, Middlesbrough.—First and final dividend of 1s. 5d. in the £, payable October 13th, at 55-57, Albert Road, Middlesbrough.

F. MITCHELL and J. MITCHELL (separate estates), electrical engineers, lately carrying on business under the style of F. Mitchell & Co., 97, Stockport Road, Ardwick, and 58, Ashton Old Road, Openshaw, Manchester.—Last day for proofs for dividend, October 14th. Trustee, Mr. J. G. Gibson, Official Receiver, Byrom Street, Manchester.

F. J. NORTH, electrical engineer, 13a, Midland Road, Wellingborough.—First and final dividend of 2d. in the £, payable at the Official Receiver's office, The Parade, Northampton.

A. THOMPSON (Arnold Electrical Co.), electrical and mechanical engineer, 38, Lucy Street, Hulme, Manchester.—Last day for proofs for dividend October 17th. Trustee, Mr. J. G. Gibson, Official Receiver, Byrom Street, Manchester.

Dissolutions of Partnership.—ELECTRO-FACTORS, electrical factors, 4, Oxford Mews, W.2.—Mr. E. A. Pye and Mr. F. J. Whaten have dissolved partnership. Debts will be attended to by Mr. Pye, who will continue the business under the same style.

HONE & STAMMERS, electrical engineers and wireless contractors, 46, Malden Road, New Malden.—Mr. B. F. Stammers and Mr. H. P. G. Hone have dissolved partnership. Mr. Stammers will attend to debts.

Company Liquidations.—WILL SMITH, LTD., electrical engineers, 281, West Derby Road, Liverpool.—An adjourned meeting of creditors was held recently. At the statutory meeting held previously a statement of affairs was submitted which disclosed liabilities of £2,028, and net assets of £43, leaving a deficiency as regarded the creditors of £1,985. The meeting was adjourned to enable the debenture holder to be asked to withdraw her claim in favour of the unsecured creditors. This, however, she was not prepared to do, and the adjourned meeting eventually broke up without any resolutions being passed; the matter will therefore remain with the present liquidator.

C. F. HENDRICK & Co., LTD., loud speaker manufacturers, 10, Berwick Street, Victoria, S.W.1.—A meeting of creditors was held on September 28th, when the chair was occupied by Mr. H. R. Gothard, C.A., 8, Laurence Pountney Hill, E.C., who stated that he had been appointed to act as the liquidator in the voluntary liquidation of the company. The statement of affairs presented disclosed liabilities of £507, and net assets of £16, leaving a deficiency of £491, subject to the costs of liquidation. Mr. Gothard reported that in addition to the liabilities shown on the statement of affairs there was a certain amount due to directors. The company was formed on September 4th, 1924, with a nominal capital of 3,000 shares of £1 each. It was stated that 750 shares were allotted to Mr. Hendrick as consideration for the purchase of an invention. In addition 1,502 shares were taken up for cash. No sales had taken place at all. The stock was mostly partly finished and if sold by auction would not fetch more than £50. Mr. Gothard added that there was every possibility of a reconstruction and in that case the creditors would be paid in full. It was decided to confirm the voluntary liquidation of the company with Mr. Gothard as liquidator. The following are creditors:—

	£		£
New Synergy Co.	22	Wandsworth Die Casting Co., Ltd.	40
Sulfite Mfg. Co., Ltd.	24		

Deeds of Assignment.—W. WILSON (J. Rattray & Son), plumber and electrical engineer, 293, Great Western Road, and 1, Westbourne Terrace, Glasgow.—Particulars of claims to be forwarded immediately to the trustee, Mr. J. McNicol, 59, Bath Street, Glasgow.

J. A. H. HALIFAX, electrical engineer, 24, Duckworth Grove, and 5, City Road, Bradford.—Particulars of claims by October 28th to the Trustee, Mr. J. E. Turner, 2, Piccadilly, Bradford.

Private Arrangements.—CHARLES GATES, LTD., electrical engineers and wireless dealers, Norwich.—A conference of the creditors of the above was held on October 2nd, at the Royal Hotel, Norwich, when the representative of the bank, who were creditors for £585, was elected to the chair. The statement presented disclosed liabilities of £3,468, whilst the assets were estimated to realise £1,707. From the latter amount had to be deducted £131 for preferential claims, leaving net assets of £1,575, or a deficiency of £1,892. It was stated that the claims of the trade creditors totalled £2,882. The company was registered in March, 1924, with a nominal capital of £2,000, of which approximately £1,100 had been issued. There were two directors, and the accountants reported that during the twelve months to March last the turnover was in the neighbourhood of £9,000. The gross profit earned had been insufficient, having regard to the working and overhead expenses. It was further stated that the accountants had been investigating the matter on behalf of a client, who was contemplating finding capital for the business. It was possible that something like £1,000 would be found for the company. After discussing the position, it was decided to appoint a committee to consider the matter, and to deal with any offer which might be received. The committee consisted of the representatives of the Cable & Electric Accessories Co., Burndept., Ltd., Chloride Electrical Storage Co., the Hart Accumulator Co., and one local creditor.

The Institution of Rubber Industry.—At the annual general meeting of the London and District Section, on September 28th, Mr. D. A. S. Porteous (Messrs. Johnson and Phillips, Ltd.), was elected chairman, and Mr. S. C. Mote (India Rubber, Gutta Percha and Telegraph Works Co., Ltd.), as vice-chairman. Dr. T. J. Drakeley (Head of Department of Chemistry and Rubber Technology, Northern Polytechnic Institute), was re-elected hon. secretary. Dr. Drakeley stated that 180 new individual members had joined the Institution during the previous week. Members of the Section are paying a visit to the laboratories of the Netherland Government Rubber Institute, at Delft, Holland, at the invitation of Dr. A. van Rossem (Director of the Institute). They were to leave London last night (Thursday), October 8th, and return by Sunday morning next. On Monday last at a meeting held at the Engineers' Club, Sir Chas. Higham read a paper on "Collective Advertising."

Book Notices.—"Arctic and Western Hudson Bay Drainage (and Mississippi Drainage in Canada) in Alberta, Saskatchewan, Manitoba, and Western Ontario, Climatic Year 1922-23." (Pp. 234 and map.) Ottawa: F. A. Acland (Government printer).—This publication is a mass of detailed information regarding stream measurement and similar matters, compiled by the Dominion Water Power Branch, Department of the Interior.

"Faraday House Journal." Vol. XI, No. 4. London: Faraday House.—The Michaelmas term issue, besides the usual notes and notices, contains an article entitled "A Three-phase Balanced Load Wattmeter," and another on "The Pressure Testing of Cable Lines with D.C." It is satisfactory to note the long list of appointments secured by Faradians, and the official "blazer" badge of the College is illustrated.

"On the Road," by W. H. Beable. 115 pp. London: Simpkin, Marshall, Hamilton, Kent & Co. Price 5s. net.

"The Confessions of a Capitalist," by Sir E. J. P. Benn, Bart. Pp. vii+287. London: Hutchinson & Co. Price 18s. net.

"Modern Picture Theatre Electrical Equipment and Projection," by R. V. Johnson. Pp. xii+170; figs. 79. London: Crosby, Lockwood & Son. 15s. net.

"Modern Advertising," an authoritative guide to the use of every form of present-day publicity (to be completed in 20 fortnightly parts). Part I. London: Sir Isaac Pitman and Sons, Ltd. Price 2s. each part.

"Circular of the United States Bureau of Standards."—No. 276, Motor-Vehicle Headlighting. Price, 20 cents.

Local Exhibitions.—SCUNTHORPE AND FRODINGHAM.—An electrical exhibition was opened on September 28th by the chairman of the municipal Electricity Committee (Mr. Donald Munro) at the Central Auction Rooms. The show remained open for the rest of the week.

NOTTINGHAM.—The electrical exhibition organised by the Nottingham branch of the Electrical Contractors' Association was to be opened yesterday (Thursday). The exhibition has the support of the Corporation Electricity Department, and sixteen members of the Association have erected stands. The result is a very comprehensive demonstration of electricity in service, the arrangements having been made under the supervision of Mr. W. A. Gillott. The Corporation's exhibit takes the form of a bungalow, each room of which is equipped with the appropriate electrical appliances.

New German Company.—With the title of the Gesellschaft fur Hochvolt Isolation a new company has lately been formed in Dresden to manufacture insulating material for very high voltages.

Large Foreign Orders.—An optimistic note is struck in *British Industries*, dated September 30th, in the publishing of a list of important orders from oversea countries secured by members of the Federation of British Industries. It is stated that one of the surest signs of a return to stability in the world's commerce and industry is the increased magnitude and number of orders for export of their products received and accepted by British engineers. Among the orders quoted are the following:—Six additional patent stokers for the Buenos Aires Central Electric Station; three Marconi radio-telegraph and telephone installations of the "YBI" type; a 3,000-line automatic telephone exchange for Fontainebleau (Paris); and the erection and equipment of an electrolytic plant in Paris.

Japanese Machinery Import Restriction.—Advices from the F.B.I. correspondent in Tokyo show that a committee of investigation consisting of Governmental and business people has been set up to study the question of reducing the importation of machinery as much as possible. The committee has been named the National Product Investigation Association, and its terms of reference include the following:—(1) To investigate the present Customs tariff in connection with the development of the Japanese electrical industry; (2) to consider the advisability of establishing a system of inspection

of Japanese-made machinery in order to improve the quality; (3) to consider the granting of subsidies; (4) the adoption of a standard rating for electrical machinery; (5) the reduction of reckless competition between makers; (6) an investigation of the possibilities for reducing imports.—*The Times Trade and Engineering Supplement.*

"Use Electricity."—The autumn number of this little quarterly booklet, which has been regularly issued by the North Metropolitan Electric Power Supply Co. to its consumers and others in its area since 1919, bears on the front cover an amusing sketch of "Mr. Switch of the North Met," whose helpfulness from morn to eve is exemplified inside. The company, which has added 2,375 premises to its connections during the first half of 1925, offers a fixed charge and low unit rate for all domestic purposes, and nearly 1,000 consumers have adopted this attractive tariff, known as the "Annual Service Rate." Two new showrooms have recently been opened, making a total of 16.

New Indian Company.—A new company has lately been formed at 2, Fairlie Place, Calcutta, with a capital of 500,000 rupees and the title of the Electric Welding and Manufacturing (India) Co.

Hackney Strike Failure.—The strike of employés at Hackney electricity works, which was to have taken place last Friday afternoon, failed to materialise. Only eight men ceased work, the others refusing to obey the strike notices, and there was no interruption in the electricity supply. Seven of the men who struck returned to work later. The dispute arose from the employment of a jointer who was not a member of the Electrical Trades Union. The 20 wiremen employed in the wiring of the Council's new showrooms, who ceased work, have been deemed by the Council to have resigned.

Trade Openings in Bulgaria.—A Sofia correspondent of the *Financial Times* says that there is, without doubt, an opening for British trade in Bulgaria, more especially in the matter of textiles and machinery. Machinery of all kinds is needed for agriculture, irrigation, electricity, and automobiles. For the first five months of the year imports from Great Britain amounted to £700,000, an increase of 50 per cent. as compared with the similar period of 1924. This shows that the trade is to be found in spite of competition from Italy, France, and Czecho-Slovakia. It is stated that British goods are recognised as the best, and the price is not so much of a difficulty as the method of paying for them.

Wage Reductions Unprofitable.—Speaking at a luncheon of the American Chamber of Commerce in London last week, Mr. E. A. Filene, a prominent American business man, said that mass production and mass distribution were the order of the day if a country was to find success. Reduced wages and longer hours would not necessarily mean cheaper or greater production. He concluded by saying:—"For the first time in history it pays to pay good wages."

Machinery for New Zealand.—The New Zealand Railway Department intends to make extensive additions to its workshops in the Dominion which will involve the purchase of very considerable quantities of up-to-date machinery. It is intended, as far as possible, to place the orders for this machinery in Great Britain. Particulars of requirements are now with the New Zealand High Commissioner in London, who is receiving many inquiries from British firms.—*The Times.*

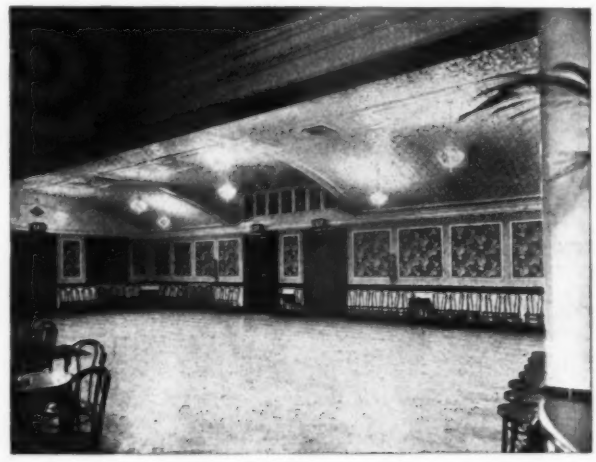
Egyptian Government Contracts.—The *Board of Trade Journal*, dated October 1st, contained a further reminder to British manufacturers that the lists of tenderers for supplies for the Egyptian State Railways, Telegraphs and Telephones are being revised, and a new application must be made by any firm desirous of being placed on the lists. Among the materials specifically mentioned are electrical materials, lifting machinery, lighting materials, signalling material, and telegraph and telephone materials. Applications should be addressed, by October 15th, to the General Manager of the Egyptian State Railways, Telegraphs and Telephones, Cairo, and the reference 129.45/7 should be quoted.

The 1925-26 E.D.A. Conferences.—As we mentioned in our last issue, the 1925-26 series of Conferences organised by the British Electrical Development Association commences on October 15th with a demonstrated address by Mr. W. E. Bush on "Selling Better Lighting to the Shopkeeper," at the E.L.M.A. Lighting Service Bureau; the programme will be repeated on the following evening. On November 20th the *venue* will be Caxton Hall, Westminster, and a paper on "Assisted Wiring Schemes" will be read by Mr. James Edgar (South Shields); the chair will be taken by Mr. R. P. Sloan, C.B.E. A display of electrical films will be given at Australia House on December 18th. Mr. Ll. B. Atkinson, M.I.E.E., will be the principal speaker on January 15th, his subject being "Suggestions and Auto-Suggestion in Salesmanship"; the chairman will be Sir Philip Nash, K.C.M.G. Mr. Walter Riggs, A.M.I.E.E., will occupy the chair on February 19th, when Mr. G. Blair Imrie (Messrs. Imrie & Angel) will speak on "The Electrical Industry and the Architect." The final meeting will be held on March 19th; Mr. D. N. Dunlop will be in the chair and Mr. J. J. McKenna will deliver an address on "The Progress and Prospects of Commercial Electric Cookery." The last three meetings are to be held at Caxton Hall. Definite limits have been fixed for the conferences, the programme stating that they will commence at 7.30 p.m., and terminate at 9.30 p.m. The programme also says: "There are no fees. Everyone electrical cordially invited."

Radio Apparatus in South America.—In a review of the radio apparatus market in South America, *The Times Trade and Engineering Supplement* states that in Chile the United States and Germany hold the lead as suppliers, chiefly owing to price considerations, as the main demand is for the cheapest sets which will operate satisfactorily. While the buying public realises the good quality of British apparatus, prices are too high. It is estimated that the United States' share of the trade has increased from 60 per cent. in 1924 to 75 per cent. this year. At the same time, the German share has fallen from 20 to 12 per cent., and that of Great Britain from 15 to 9 per cent. In Brazil the position is better; recent figures show that Great Britain is pushing ahead, and in 1923 British exports of radio apparatus to Brazil were slightly higher than those of the United States. In dealing with Brazilian firms, it should be remembered that rather extended credit facilities are required; agents' catalogues should be in Portuguese; and advertising is very necessary. The Germans have a good hold of the electrical industry, and their commercial acuteness is shown by the German manufacturers' system of combining non-competitive agencies for marketing composite lines of electrical merchandise. The Uruguayan market is good; the United States supplies the bulk of the goods, followed by Great Britain and Germany. The ten-year concession secured by the Peruvian Broadcasting Co. opens up an assured and progressive market for radio goods in that country. Ecuador and Colombia are moderate markets, but the importation of receiving sets into Venezuela is at present prohibited.

Fire.—Early on the morning of September 29th a fire occurred in the Test Department of the British Thomson-Houston Co., Ltd., at Rugby.

The Lighting of an Assembly Hall.—The accompanying illustration is a view of the Muswell Hill Assembly Hall, a new building which has recently been illuminated throughout by Messrs. Wight & Co., Finchley. From the ceiling of the main hall are suspended three rows of "Unalux" units equipped with "White Osram" lamps. This equipment provides an even, glareless illumination. The steps of the entrance hall are illuminated by two units fitted beneath the portico, comprising special fittings with G.E.C. "Superlux" globes, and two "Unalux" units light the entrance hall. Over the serving counter of the bar two cord pendants are fitted with "Equiluxo" glassware of the distributing type. In the wine and spirit stores, immediately behind the bar, illumination is provided by special ceiling fittings with "Superlux" globes; and a single "Unalux" unit provides the general illumination of the bar. A special feature of the installation is the number of wall plugs fitted at various points round the hall, for the purpose of enabling spotlights and projectors fitted with rotary colour screens to be used. In the grounds experiments are being carried out with G.E.C. "Fairyland" strip and "Osram" colour-sprayed lamps. Floodlight projectors fitted with colour screens are also being tried, with the aim of producing decorative colour effects in the trees.



Muswell Hill Assembly Hall.

British Machinery for Russia.—M. Bogdanov, the president of the All-Russian Supreme Economic Council, who is at present in London, interviewed by a representative of the *Financial Times* recently, said that his purpose in coming to Great Britain was to become acquainted with the condition of British industries, and the possibility of placing orders for a variety of equipment and machinery in this country. "Already a million pounds' worth of equipment for the textile industry has been placed in Great Britain. Negotiations are proceeding for further quantities of machinery, as well as for ship construction, power installations, &c., but we expect to be offered acceptable terms of credit for our orders."

Electrical Equipment for Buenos Aires.—Plans for the electrical equipment of the new port of Buenos Aires have been prepared and submitted by the Director-General of Navigation and Ports to the Government. A preliminary estimate of the cost of the installation amounts to 840,000 pesos. —*Reuter's Trade Service* (Buenos Aires).

Australian Electrical Imports.—It is stated that the value of the imports of machinery into Australia during the fiscal year 1924-25 was £1,822,543 in excess of the 1923-24 figure, owing principally to the larger imports of electrical apparatus.

Indian Trade Commissioner's Address.—The *Board of Trade Journal* states that as from November 1st the address of Mr. T. M. Ainscough, C.B.E., the Senior Trade Commissioner in India, will be: Fairlie House, Fairlie Place (P.O. Box 683), Calcutta.

An Anglo-South American Association.—An Anglo-South American Association has been formed, with offices at 25, Haymarket, S.W.1, for the promotion of British trade in South America. The Association has only one object—to inform public opinion on the vital urgency of recapturing the great Latin-American markets. It has the support and co-operation of some of the most prominent business men in the country; among those who have already promised to be vice-presidents are:—Sir Godfrey Baring, Bart., Sir Trevor Dawson, Bart., Sir Robert Hadfield, and Sir Arthur Stanley, G.B.E. A circular issued by the Association says that British investments in South America amount to over £1,100,000,000. There is half a billion of money in Argentina alone; there is a quarter of a billion in Brazil. Even in the comparatively small and unexploited Venezuela we have £10,000,000, and it is significant that nearly all the latter's rich oil and mine workings have been subsidised by British money. "South America wants to trade with us more than anybody. The South American Republics have never forgotten what the British people did for them in the cause of Latin-American freedom. They would rather see our ships and traders than those of any other country in the world, and we intend to see that this fact is brought home to everybody in Britain, and particularly to our traders whose commercial interests can be directed to South America. Higher prices, due to higher wages, have not been the only reason why we have lost our South American orders. We have not shown the energy, the enterprise and the personal enthusiasm of our competitors. Informed public opinion can alter this. To-day South American markets are in effect the greatest and perhaps the only markets in the world where we can hope completely to recover our prosperity from the appalling industrial set-backs of the last 11 years. Germany has not been slow to see its possibilities, nor has the United States."

A B.T.-H. Film.—During the next few months a film produced for the British Thomson-Houston Co., Ltd., will be exhibited at many of the leading kinemas. The title is "Listeners-in," and in a skilful and ingenious manner B.T.-H. headphones are introduced at various points of a romantic story. A series of coloured showcards has also been issued in connection with the "Mazda" lighting and radio campaigns. One of these is a chart showing the voltage of lighting sets and the type of lamp cap employed on passenger automobiles, commercial vehicles, and motor-cycles of numerous makes.

Manufacturers' Tariff Campaign.—Speaking at the annual meeting of the National Union of Manufacturers last week, Mr. George Terrell (president) characterised the Safeguarding of Industries Act as a failure. He said: "The Government scheme has been in operation for nearly eight months, and so far only one industry has been able to obtain the benefit of it. Many industries dare not apply, as from the definite experience of the last few months they know that the procedure is so dilatory, so inquisitorial in character, and the results so uncertain, that they would get an abnormal dump of foreign goods in the interim, which would probably put them out of business for months to come." The Union has decided, therefore, to undertake an extensive propaganda campaign to impress upon the people of this country the need for protecting British industries. A part of the scheme is the training of 50 lecturers to present the Union's case in all parts of the country.

British Trade Mark Applications.—The following are among the recent applications for British trade marks. Objections against any of the proposed marks may be entered within one month from September 30th. In the case of foreign applications, the name and address of the British representatives are also given:—

Ledbitum. No. 461,108. Class 1. Bitumen paint. Kalvar. No. 451,110, and Kalvarfin. No. 461,000. Class 1. Varnish paint.—Callender's Cable and Construction Co., Ltd., Hamilton House, Victoria Embankment, London, E.C.4.

Ormond. No. 459,643. Class 8. Condensers, transformers, resistances, crystal detectors, all being component parts of apparatus for use in wireless telephony.—Edward Joseph L. Delfosse, trading as the Ormond Engineering Co., 199-205, Holloway Road, London, N.1.

Radio Sun (lettering and design). No. 458,398. Class 8. Apparatus for use in wireless telegraphy and telephony.—Auto Sundries, Ltd., 16a, Lower Grosvenor Place, London, S.W.1.

Radolion. No. 460,428. Class 8. Philosophical and scientific instruments and apparatus for useful purposes.—Edward A. Graham, trading as Alfred Graham & Co., St. Andrew's Works, Crofton Park Road, London, S.E.4.

Spark (design only). No. 460,486. Class 13. Sparking plugs and similar electrical devices for igniting the charge in internal-combustion engines, spark intensifiers and component parts of and accessories for ignition devices, lamps, electric lamp bulbs, electric horns, electric safety fuses or cut-outs, electric switches, junction boxes, &c.—Robert Bosch Gesellschaft, 8, Militarstrasse, Stuttgart, Germany (W. P. Thompson & Co., 12, Church Street, Liverpool).

Coico. No. 461,200. Class 13. Clips of ordinary metal for securing wires, tubes and the like to walls.—Colman & Co., 110, Dale End, Birmingham.

Mulparvo. No. 461,213. Class 18. Electric fires and radiators.—Berry's Electric, Ltd., 85-86, Newman Street, London, W.1.

Midge. No. 461,214. Class 18. Electric fires and radiators.—Berry's Electric, Ltd., 85-86, Newman Street, London, W.1.

New Spanish Company.—La Sociedad Slem is the name of a new company which has lately been formed in Barcelona with a capital of 510,000 pesetas, to manufacture and deal in accumulators.

New French Company.—A new company has lately been formed in Paris (14, Rue Drouot) with a capital of 600,000 francs and the title La Société pour l'Exploitation des Brevets et Procédés Marcel Fichter to manufacture electricity and other meters, automatic time switches, &c.

The "Mulparvo" Heater.—CORRECTION.—We regret that in the advertisement of Messrs. BERRY'S ELECTRIC, LTD., in our issues of September 11th and 25th, the left-hand block illustrating the "Mulparvo" heater was inserted the wrong way up, and also that the right-hand block showed the heater in a vertical position, whereas it has a slight backward tilt.

For Sale.—By order of the liquidator of Grigg, Ltd., electrical sign manufacturers, of Sanderstead Works, Sanderstead Road, South Croydon, Messrs. Leopold Farmer & Sons will sell by auction on the premises early in November, the stock of electrical signs, plant and machinery, also the freehold manufacturing premises. (See our advertisement pages to-day.)

German Cable Production.—In commenting upon the heavy increase in the consumption of copper which has taken place in Germany in the last year or two, *Commerce Reports* states that this is mainly due to the growth of the cable industry, the capacity of which has been doubled since the war. Germany is exporting cables in large quantities, and the works are said to have orders ahead for some months.

Polish Electrical Engineering Industry.—It is reported from Warsaw that the Protection Union of the Polish Electrical Engineering Industry has recently approached the Polish Ministry of Commerce with a request that, with the object of encouraging the development of the home electrical industry, the import duty on generating machines and motors should be increased by 30 per cent., on cables by 40 per cent., on electrical apparatus, switches, and electro-technical porcelain by 50 per cent., and on electric lamps by 100 per cent.

Unemployment.—For the third week in succession a decrease in the number of unemployed was recorded on September 21st, when the total was 1,312,000, as compared with 1,327,700 on September 14th. The total at the corresponding period of 1924 was 1,180,200.

Copper and Lead Prices.—Messrs. F. Smith & Co. report, October 6th: Copper (electrolytic) bars, £67 5s., 5s. dec. Do., do. sheets, no change; do., do. wire rods, £77 5s., 5s. dec.; do., do. h.c. wire, no change.

Messrs. James & Shakespeare report, October 6th: No change in the prices of copper bars (best selected), sheet and rod, and English pig lead.

Messrs. Edward Till & Co. report, October 6th: No change in the price of india-rubber, Para, fine.

United States Electrical Exports.—During July the United States exported electrical machinery and apparatus to the value of $6,526,668. Although lower than the previous month's figure, this was $286,259 more than the total for July, 1924. The total value of exports for the first seven months of 1925 was $47,787,634, a decrease of $2,197,011. Reverting to the July figures it is seen that there were a number of large decreases as compared with the equivalent figures for 1924. Transformers fell off in value by about one-half to $247,031; generators and parts fell from $380,500 to $370,520; electric railway locomotives from $411,495 to $14,525; stationary and railway motors from $283,742 to $206,126; telephone switchboards from over $150,000 to $50,000; rectifiers, motor-generators, and converters from about $40,000 to $29,642; and there were a number of other decreases. The principal increase occurred in the case of radio apparatus, which rose from $297,586 in July, 1924, to $643,463 in July last. Large increases were also shown by telephone and telegraph apparatus; domestic heating and cooking devices; steam turbo-generator sets; primary batteries; small motors, and many other items.

The Electrical Trade of New Zealand.—The statistics of New Zealand's import trade during the second quarter of the year, published in the *Board of Trade Journal*, show that the value of the imports of electrical machinery was £519,393. The bulk of this (£329,972) came from the United Kingdom, while the United States occupied the second place with goods valued at £141,846. Other exporters were Canada, £21,433; Australia, £7,945; and Japan, £64.

Social Event.—On September 25th, the Dubilier Condenser Co. (1925), Ltd., held its first carnival dance and whist drive at the Chiswick Town Hall, under the auspices of the Dubilier Athletic Sports Association. Two halls were used for dancing. Mr. W. H. Goodman, the managing director of the company and president of the Association, made a short speech, and Mrs. Goodman presented prizes to the successful whist players, and to the wearer of the best fancy dress (Miss Phyllis Leach). It is proposed to hold another similar function shortly.

Orders for Electric Rolling Stock.—Important additions to the rolling stock of the London, Midland and Scottish Railway, for use on the company's Southern electric system, are planned for next spring and early summer. The new rolling stock will serve the Broad Street to Richmond, and Euston to Watford lines, and is intended specially to meet the requirements of the rapidly-developing, residential district between Willesden and Watford. Orders have been placed for a large number of coaches, motors and driving trailers, which will be equipped with the Westinghouse brake apparatus. The new coaches will measure 57 feet by 9 feet and will be of the compartment standard type. New stock of similar type has been ordered for the electric line between Liverpool and Southport.

Lighting and Power Notes.

Bedford.—Extension of Supply.—The Town Council proposes to extend its area of electricity supply to Sandy at an estimated cost of £12,000, and to Potton at a cost of £4,300, and application is being made for sanction to a loan of £16,300 to cover the cost of the scheme.

Bexhill.—Bulk Supply.—The Electricity Commissioners have approved the agreement entered into between the Bexhill Corporation and the Hastings Corporation for a bulk supply of electricity to Bexhill.

Bredbury and Romiley.—Inauguration of Supply.—The Urban District Council's electricity undertaking was formally inaugurated on September 26th. Electricity is obtained in bulk from the Stockport Corporation. The capital cost of the scheme was £20,000.

Canada. — Hydro-Electric Development.—The British Columbia Electric Railway has announced plans for increasing the capacity of its existing hydro-electric generating plant to 700,000 h.p., at a cost of $30,000,000, with an immediate development on the Bridge River to cost $13,000,000 and be capable of generating 62,000 h.p.—*Reuter's Trade Service* (Ottawa).

Continental.—France.—Since the termination of the war, the Compagnie Parisienne de Distribution d'Electricité has effected considerable extensions in connection with the supply of electricity in the Paris district. Five development programmes, involving an outlay of 630 million fr., have been approved by the Paris municipal authorities, and of this sum 470 millions had been expended up to the end of last year. The plant at the St. Ouen and Issy-les-Moulineaux power stations has been increased from 120,000 to 270,000 kW by the addition of five 30-35,000-kW turbo-generators. The third programme involves the substitution for old 10,000-kW turbo-generators of new ones of 12,000 kW, the frequency being at the same time altered from 41⅔ to the standard 50 cycles to enable the company's mains to be linked up with the large hydro-electric systems which are being developed in France. The fourth programme, work in connection with which is well in hand, comprises the installation of three more 30-35,000 kW turbo-generators at the St. Ouen and Issy-les-Moulineaux stations, while the fifth is concerned with the modification and extension of the distribution mains.

Eastbourne.—Electricity Extensions Sanctioned.—The Corporation has received from the Ministry of Transport sanction to a scheme for the erection of overhead lines to provide a supply of electricity to Willingdon. The decision is the result of a recent inquiry.

East Ham.—Loan Sanctioned.—The Electricity Committee has received sanction to borrow £5,000 for the extension of feeder cables from the generating station to Plashet Grove.

Electricity Charges.—The Electricity Committee has recommended the substitution of a flat-rate charge of 1½d. per kWh throughout the year, instead of the winter and summer rates for heating and cooking.

Exeter.—Extension of Supply.—Steps are being taken to extend the h.p. cables to Topsham, and to transfer the Topsham Electricity Co.'s undertaking to the City Council. The following electricity charges are proposed in the Topsham area:—Lighting: 10d. per kWh. Heating and power: 6d. per kWh, with a minimum payment of 10s. per annum. Street lighting: 40s. per annum per lamp of an average of 50 c.p.

Bulk Supply.—The Electricity Committee has recommended that a bulk supply be given to Crediton at 6,000 V, 3-phase, the charge to be at the rate of £5 per kW of maximum demand and 1d. per kWh for energy consumed, subject to a minimum payment of £250 for the first year, £300 for the second, £350 for the third, and £400 for the fourth.

Federated Malay States.—Perak Hydro-Electric Scheme. —*Eastern Engineering* states that it is reported that Sir W. G. Armstrong, Whitworth & Co., Ltd., are prepared to proceed with the Perak river hydro-electric power scheme, subject to the satisfactory results of negotiations which are now proceeding between the company and the Trades Facilities Act Committee. The terms of the draft concession, which will cover the districts of Kuala Kangsar and Kinta, and the Chenderiang Mukim in the district of Batang Padang, are now under discussion, and will in due course be submitted to the Government for approval. The concession now contemplated will not affect the rights of existing concessions.

Guildford.—Street Lighting.—The Electricity Committee proposes to light a number of streets by electricity.

Killamarsh.—Electricity Supply.—The local gas company having intimated that it can make no further reduction in the price of gas, the Council has decided to approach the Staveley Coal and Iron Co. with a view to obtaining a supply of electricity.

London.—Battersea.—The Electricity Committee has received sanction to the borrowing of £30,000 for buildings and £90,000 for plant.

The Committee is making arrangements to supply electrical energy to shopkeepers for lighting their windows after closing hours at the special rate of 1½d. per kWh and 10s. per quarter for the necessary time-switch.

Hackney.—The Electricity Committee has recommended a scheme for cable extensions, at an estimated cost of £41,850.

Mexico. — Hydro-Electric Development. — According to *Commerce Reports*, the Compania Hidro-Electrica y Irrigadora del Chapala has signed a renewal of the contract with the Federal Government, by which the company is conceded an average of 15 cu. m. of water per second, which can be used between the top of Juanacatlan Falls and a point where the Rio Verde and El Lerma Rivers unite. The company is given the right to construct the necessary dams, and will develop new generating plants of at least 30,000 h.p.

Maidstone.—Extension of Supply Area.—The Electricity Committee has recommended to the Corporation that the scheme for the supply of electricity to the parish of Bearsted be proceeded with at an estimated cost of £6,500.

Newark.—Electricity Charges.—It was reported at a recent meeting of the Town Council that an agreement had been come to with the Derbyshire and Nottinghamshire Electric Power Co., which has powers to supply Newark with electricity in bulk, as to the price to be charged. The Council will pay the company 1.25d. per kWh, a minimum guaranteed consumption equivalent to £2,000 for the first two years and £3,000 for each subsequent year of the agreement. The Council proposes to charge power users a special basic price of £8 per kW on the annual maximum demand, plus .3d. per kWh consumed. Small consumers will be charged a flat rate of 7d. per kWh for lighting, 2½d. per kWh for domestic appliances, and 3d. per kWh for small motors.

Peterborough.—Purchase of Cookers.—The Electricity Committee is applying for sanction to the borrowing of £1,500 for the purchase of 100 electric cookers.

Preston.—Year's Working.—The accounts of the Corporation electricity undertaking (engineer: Mr. J. F. Simpson) for the year ended March 31st last show a total income of £105,542, as compared with £92,167 in the preceding year. Working expenses amounted to £64,176, as against £48,783, leaving a gross profit of £41,366 (£43,384), to which was added interest and a grant from the Unemployment Grants Committee, making a total of £43,344. After deducting capital charges and contributing £792 from revenue to capital account, a net surplus of £7,979 remained. The previous year's working resulted in a surplus of £15,876. The capital expenditure amounted to £166,824, and included £85,290 for plant, machinery, &c., at Ribble power station, and £74,156 for mains and services. The electrical energy sold increased from 7,712,908 to 9,798,324 kWh, and the maximum supply demanded from 3,460 to 4,000 kW.

Price Reductions.—Reductions in the charges for electricity have been made or recommended in the following districts:—

Stafford.—Heating and cooking: 1d. per kWh.

Burnley.—Lighting: In the borough, from 5½d. to 5d. per kWh; for certain "off-peak" hours the charge will be 2½d. per kWh. Outside the borough, from 6½d. to 6d. per kWh, and for certain "off-peak" hours, 3d. per kWh. Heating and domestic purposes: Flat rate of 1½d. per kWh.

Erith.—Heating: From 3d. to 2d. per kWh.

Hebden Bridge.—Domestic purposes: From 1½d. to 1¼d. per kWh.

Salford.—Charges for Electric Cookers.—The Electricity Committee has adopted the following scale of charges for the hire of electric cookers:—Small standard cooker, a rental of 7s. 6d. per quarter; medium standard cooker, 10s. per quarter. These charges include the provision of a thermometer and an electric kettle, also free wiring up to a maximum of 50 ft. and free maintenance.

South Africa.—Cape Town.—Work has commenced on the new power station near the mouth of Salt River. The erection of the station is part of a scheme which involves an expenditure of about £1,000,000. When completed, the station is intended to supply the energy required for the electrification of the Cape Peninsula railways.

Southampton.—Year's Working.—The report on the working of the Corporation electricity undertaking (engineer: Mr. W. G. Turner) for the year ended March 31st last shows a total income of £173,654, as compared with £149,780 in the preceding year. Working expenses amounted to £111,002, as against £101,123, leaving a gross profit of £62,652 (£48,657). Interest and sinking fund charges absorbed £40,018, special expenditure charged to revenue amounted to £15,355, and £5,000 was contributed to the borough fund, leaving a balance carried forward of £2,279. During the year £110,907 was spent on capital account, the chief items being £41,037 for machinery, &c., £59,510 for mains and services. The electrical energy sold increased from 13,416,882 to 17,909,256 kWh, and the maximum supply demanded from 8,363 to 10,064 kW. A 6,000-kW turbo-alternator was put into commission in December last, and the second 1,000-kW rotary converter put into operation at Back-of-the-Walls sub-station in January.

Spalding.—Electricity Supply.—In granting the Urban District Council a Special Order to supply electricity within the urban and rural areas, the Electricity Commissioners have intimated that they consider the offer made by the Boston and District Supply Co., Ltd., for a supply of electricity in bulk to be satisfactory and one which should be accepted by the Council. The Council desires to have its own generating plant at the gas works, and the estimated cost of this scheme is £30,000.

(*Continued on page* 583.)

A

The p
at Ma
a visi
of Wa
under
mises
and s
build

steel-
cent
is de
cotto
carri
ing i

Th
the p
the v
be p
mach
mach
witho
All s
of in
made
up to
ing t
from
stran

Th
nery
effect
porti
wher
r u b
rubb
rubb
chine
and
each
set o
deps

F
the
stran
stran
gaug
stran
medi

An Electric Wire and Small Fittings Factory.

A Visit to the Works of Messrs. Ward & Goldstone, Ltd., Manchester.

The present factory of Messrs. Ward & Goldstone, Ltd., at Manchester, to which we had the opportunity to pay a visit recently, was established in 1918, when the firm of Ward & Goldstone was converted to a public company under the style of Ward & Goldstone, Ltd. The premises, which cover an area of about two acres of ground and six acres of floor space, consist mainly of a two-bay building constructed on modern factory lines with steel-framed glass roofs, and an additional and adjacent three-storey brick building. The main building is devoted principally to the manufacture of rubber and cotton cables, the stranding and rubber covering being carried out in one bay and the vulcanising and braiding in the other.

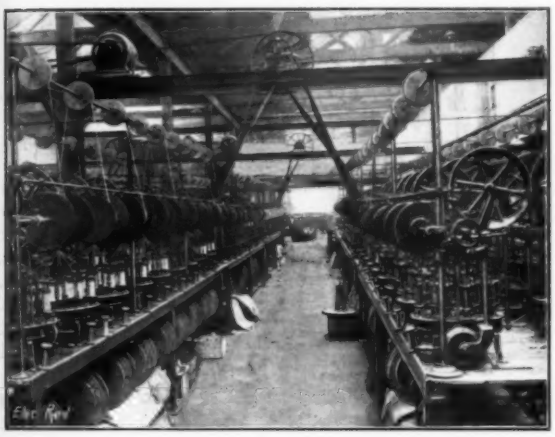


Fig. 1.—Corridor in Braiding Department.

The lay-out of the machinery is such as to facilitate the progress of manufacture, enabling the material in the various stages to be passed from one machine, or group of machines, to another without congestion. All sizes and grades of indoor cables are made at the works, up to 37/12, including the whole process from the wire stranding.

The cable machinery operations are effected in the centre portions of the bays, where the stranding, rubber covering, rubber-winding and rubber-forcing machines are located, and the plant for each operation is set out as a separate department or shop.

Fig. 7 is a view of the heavy wire-stranding department. The machines at the front are stranders of the tandem type, used for the heavier gauges of wire, while at the back, high-speed torpedo stranding machines are in service for the stranding of medium- and light-gauge wires. The stranding of flexible wire is a very delicate operation, and is effected by these machines at high speeds.

Three methods of rubber covering are used according to the grades of cable required. Fig. 3, p. 580, is a view of the longitudinal rubber-covering machines, in which the conductor is rolled between two strips of rubber, the machine rollers being grooved to accommodate the cable, where it is covered and the rubber sealed on each side, and some of the heavy-wire rubber insulating machines are shown in fig. 4. Some of these machines give the wire two coverings of rubber in one operation or journey through the machine. The rubber-winding machines are very similar in design to the tandem stranding machines, the rubber strip being rotated about the travelling wire. One machine in this department is of particular interest, in that it effects rubber lapping and cotton covering twice in one operation. These machines are used particularly for the manufacture of bell wire. The rubber-forcing machines are chiefly used for cab-tire sheathed cables, the inner insulation of which is applied first by the rubber-covering equipment. The rubber is forced through a mould surrounding the travelling wire, the mould being heated by steam. The cables, after being dealt with by the rubbering plant, are taken to the vulcanising department. This is situated at one end of one bay and is equipped with two large and one small vulcanising pans, one large one of which is shown in fig. 6.

The next performance in the manufacture of rubber cable, braiding, is carried out in the braiding shop, fig. 1, where there are two parallel rows of vertical braiding machines using hemp, pure silk, or ordinary cotton according to the quality and size of the wire required. The cables pass through the revolving reels of hemp, &c., and are taken off spools under the benches and rewound on others at the tops of the machines. The pattern-braiding process, in which revolving reels carry material of varying colours, is a fascinating operation. Compounding tanks are provided at the far end of the factory for the next operation, where the cables are run through hot bitumen fluid. These tanks are easily convertible for use as enamelling tanks, the process being very similar.

Fig. 2.—Fine Silk- and Cotton-Covering Machines.

All cables are tested before dispatch in a well-equipped test room. Mirror-galvanometer tests are applied to the insulation, and bridge tests to the conductors. The wires are also subjected to pressure tests, in which a pressure of 5,000 V is put on the cables for 15 to 30 minutes. A small motor generator and a transformer are provided for the purposes of these tests.

Fig. 2 is a view of the fine silk- and cotton-covering machines which deal with all qualities of flexible cords, including telephone leads, for the Post Office and Admiralty, and leads for automobile equipment. Very delicate silks are used in this portion of the works, which is rather more suggestive of a silk or a cotton mill than a cable works. The machines shown are of the multiple type, each applying two or more coverings in one operation. The bench at the front is the testing bench for this class of cables, which are examined under a microscope as they are unreeled and rewound from one spool to another. Fig. 8 shows the double cotton-covering machines.

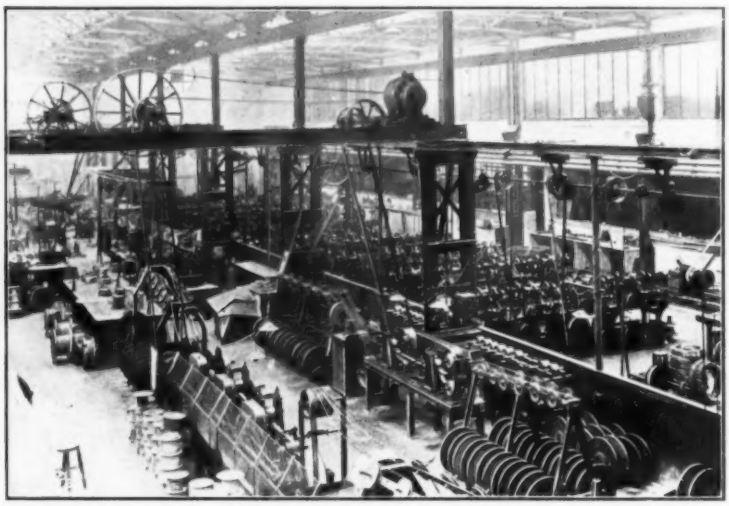


Fig. 3.—Longitudinal Rubber-Covering Machines.

Considerable motor-car cable work is done in this department. This cable is taped with oilproof tape, braided, and then varnished. The varnishing room is in front of the test bench, where a very high grade of varnish, which is claimed to stand the most severe bending test, is used. This process is also used for wire for armature and field coils for small motors, &c. A large quantity of the motor-car cable is armoured, and this performance is done on machines which wind either aluminium, brass, or other metal wires neatly round the cables or leads.

The front end of the main building is arranged in two storeys, the upper floor of which consists of the loom department and the cord room. In the former the telephone and motor-car multiple leads are put through their final operations. The telephone cords are plaited by either of two machines, 4-way or 6-way, which were built to Mr. Ward's own design. The terminals are sweated to the leads in dipping baths in this section of the factory, and the multiple leads are braided by machines which are skilfully operated to reduce the size of the braiding at the ends of the leads, where a lesser number of "singles" is accommodated, and also, in the case of head 'phone leads, &c., to make neat joints where the conductors branch off. The cord room is devoted wholly to telephone cords. The ends of the flexibles are stripped and bound in preparation for the terminals of varying shapes by a looping machine, another little device of Mr. Ward's design. An interesting product of the firm of Ward & Goldstone is what is termed I.E.E.-quality flex. This is treated with two layers of pure rubber, and then cotton covered, braided, and finally twisted. The drums on which the wire is dispatched from the works are made in a well-fitted-out joiners' shop. separate department deals with the winding of instrument wires on small reels and special drums. Fig. 5 shows the fine flexible wire-stranding machines.

The manufacture of the accessories is carried out entirely on the two upper floors of the three-storey adjacent building already referred to, the greater part of the ground floor of which is used as the general stores. Probably the most interesting manufacture undertaken in this building is that of a special insulating compound in the form of bases for wireless coil holders, Home Office pattern lamp holders, &c. The material is produced from a special powder of Ward & Goldstone's own preparation, which is put into moulds and heated under pressure on hand-operated highly-geared moulding presses. Six of these presses are at present installed, three steam and three electrically heated. The product is a black compound of very superior finish, and it is claimed that its insulating qualities are exceptionally high, and that it will withstand a very high temperature without breaking or crumbling. In cases where metal parts are embedded in the compound, these are, of course, placed in position in the mould with the powder before it is put on the pressing machines.

The first floor of this block is devoted to the manufacture of switches and light metal work, including all manner of wireless apparatus, ironclad switches, fans, G.P.O. telegraph sounders and tappers, &c. The bulk of the metal work is turned on standard capstan lathes in the machine shop. Automatic machines are also provided for turning up brass parts, such as adaptors for headlights for cars. A few engraving machines on which the firm's own engraving is done are also installed in this room.

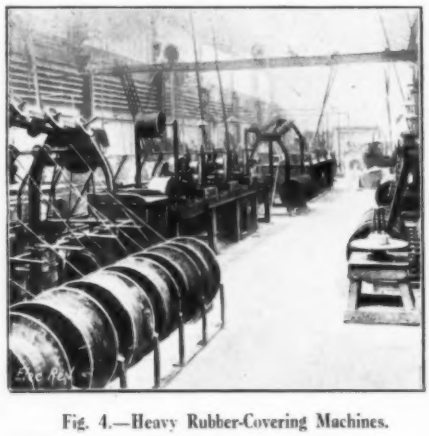


Fig. 4.—Heavy Rubber-Covering Machines.

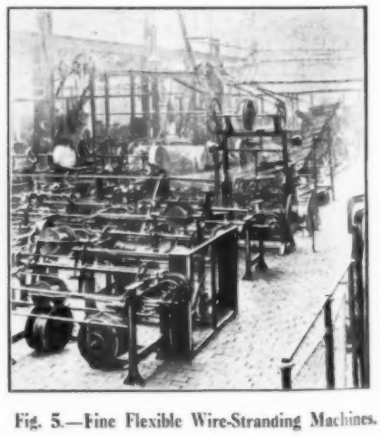


Fig. 5.—Fine Flexible Wire-Stranding Machines.

The top floor is equipped with apparatus for metal stamping, stove enamelling and nickel plating, &c. Magneto plates for automobiles, wireless transformer stampings, and similar work are turned out on metal stamping machines. Two Canning nickel-plating machines are installed in a room divided off from the machine room. The assembling of all manner of small accessories is undertaken on this storey, including such articles as "Voltalite" generators and lamps for cycles.

Electric drive is used throughout the factory, and in several departments, including the braiding room, fig. 1, this is arranged overhead by motors mounted on steel girders. The supply is at present d.c., and is received direct from the Salford Corporation electricity works, but it is about to be converted to 3-phase a.c., and a sub-station is being provided to receive a high-pressure supply at 6,500 V, which will be reduced to 420 V by a 200-kVA static transformer. A low-pressure 6-panel open-type slate switchboard is being erected by Messrs. Ward and Goldstone for distribution throughout the works.

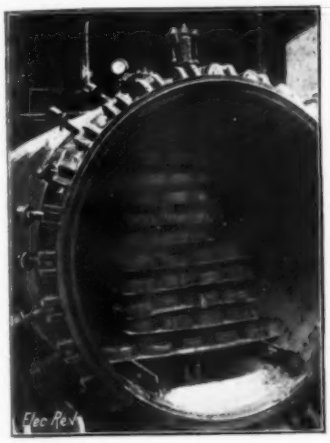


Fig. 6.—Vulcanising Pan.

Fig. 7.—Heavy Wire-stranding Department.

The works are at present turning out over a million yards of flexible cord per month, and are capable of dealing with 30 to 50 tons of wire per week, but it is anticipated that with extensions to the factory which are now well in hand, this output will be doubled. The extensions will comprise a new bay to the main building, measuring 120 ft. by 35 ft., with an additional extension of 40 ft. by 30 ft.

About 750 hands are employed at the works, and the majority of the charge hands are given a financial interest in the concern. Canteens are provided for the benefit of all employés whose social life is not overlooked, sports, clubs, &c., being organised for their entertainment.

It is interesting to recall that the original works of Ward & Goldstone were established 30 years ago in a small workroom, where a steam engine operated the first wire-covering machine. The founders and directors of the firm are proud to be able to claim that to some extent the firm has changed the situation which existed in the early days, when the flexible-cable industry was largely in the hands of foreign manufacturers.

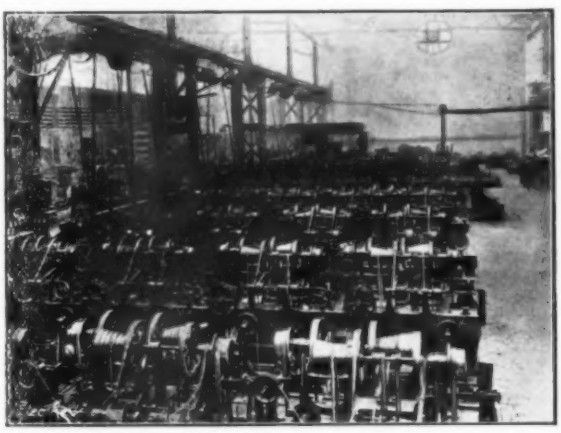


Fig. 8.—Double Cotton-Covering Machines.

Hydro-Electric Progress in Switzerland.

Some Details of the Amsteg (Uri) Power Station.

THERE are several interesting features in the hydro-electric station recently established by the Swiss Federal Railway authorities at Amsteg (Canton of Uri) in connection with the supply of electricity for the Gothard line. The station utilises the water power of the River Reuss, between Gurtnellen and Amsteg. The barrage is located at Pfaffensprung, and impounds 200,000 cubic metres of water, at an available head of 270 m.; it is constructed on the arched-dam system, as shown in figs. 1 and 2, reproduced from the *Génie Civil*. The height of the dam is 21 m. from the river bed, and the width of the span at the top 25 m.; the masonry is 3.5 m. thick at the base and 1 m. at the top, where the radius curvature is 18.5 m. Theoretically, a thickness of 2.2 m. at the base would have been sufficient. The structure was mathematically investigated as though it were the arch of a bridge, with regard to the effects of compression and changes of temperature, and in order to secure the most favourable conditions, vertical joints at four places in the upper portion were left open during the construction and after the barrage had been exposed to cold weather for a long time they were closed with cement mortar. The work was finished four years ago, and has been under load for three years with completely satisfactory results. From the intake the water is conveyed under pressure to a water tower through a tunnel 4⅝ miles in length, and of approximately 70 sq. ft. section. The water tower, which is situated above the village of Amsteg, consists of a shaft 16.4 ft. in diameter and 98½ ft. deep, cut in the solid rock; at its lower end it is connected to a gallery 360 ft. in length and 753 sq. ft. in section, and at its upper extremity to a discharge shaft 262 ft. long and 236 sq. ft. in section. From the water tower the water is conducted to the station by means of three steel pressure conduits, each 1,476 ft. in length and of a diameter partly of 5.9 ft. and at the lower end of 5.25 ft. Each of the pipes is intended to feed two 10,000-kW turbine-generators.

So far only five sets have been installed. The turbines are of the Pelton type, constructed by the Société des Ateliers de Constructions Mecaniques, of Vevey, and are coupled direct to Oerlikon alternators. Work is, however, well in hand on the construction of the sixth set.

The turbines are designed to work with water under a head of 902 ft. and a delivery of 1,045 gallons per second, the running speed being 333½ r.p.m. When the station was first projected two schemes were considered, one involving the use of single-rotor turbines operated by two jets, and the other turbines with twin wheels

Fig. 1.—The Dam seen from above.

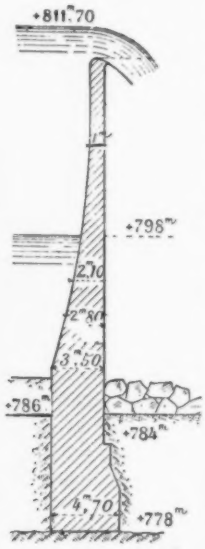


Fig. 2.—Section of Dam at Key.

on the same shaft, each actuated by a single jet. The railway authorities finally decided in favour of the latter type, which possesses the advantage of having more readily accessible injectors and a better water flow. The diameter of the wheels is 6 ft. 1 in., and that of the two jets 215 mm.—about 8.4 in. It is claimed that they are the largest jets so far used in Europe. Each of the wheels is enclosed in a separate casing mounted on

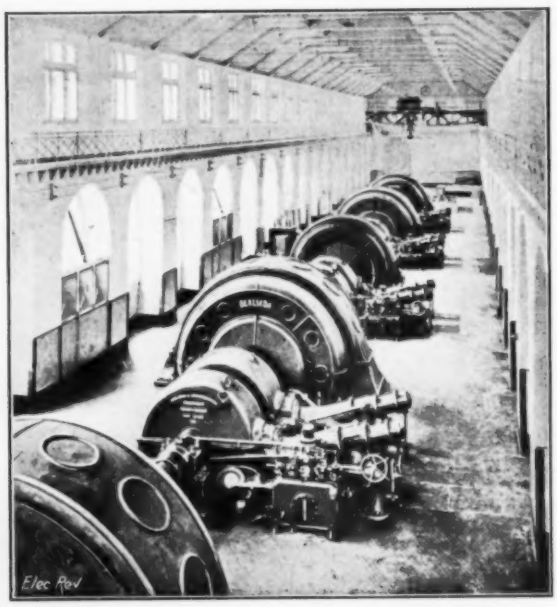


Fig. 3.—The Interior of the Turbine Room.

a common cast-iron base located on steel plates, these being employed in order to protect the masonry of the discharge canal from the action of any water projected from the wheel outlet and from the jets when the latter are suddenly charged.

The Pelton wheels comprise 20 cast-steel blades or vanes, polished on their inner faces; as each vane receives no fewer than 333 17½-ton impulses per minute, special attention was devoted to their secure attachment, this being effected by two special rings bolted to the hub disk, an arrangement which also makes it possible to dismantle the vanes without disturbing the disk.

The two cast-steel injectors each carry a tuyere of similar material with a bronze nozzle, which can be readily renewed. A needle valve in the centre of the circular tuyere enables the water supply to the turbines to be adjusted in accordance with the load. The needle valves are screwed to rods which at their outer ends carry the adjusting pistons of the oil-pressure servo-motors. The thrust of the water on the needle valve is partially balanced by powerful steel springs mounted within the servo-motors to facilitate hand regulation. Although the tendency of the needle valve in all its positions is to close the tuyeres, any sudden closing is rendered impossible by means of a special arrangement of the servo-motors to act as oil brakes should the needle valve close. A second system of control is furnished by a deflector screen surrounding the jet, by means of which the water can be instantly diverted from the turbine in the case of a sudden decrease of load, the screen being actuated by an independent

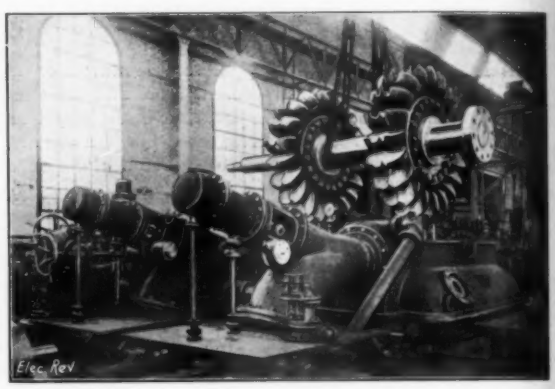


Fig. 4.—A Pelton Turbine During Erection with the Twin Wheels Suspended.

servo-motor. In order also to prevent any interruption of the supply in the event of accident to the double-action regulator, a device has been incorporated by means of which, in such a case, the hand regulation gear is automatically brought into action. An automatic speed controller is also included in the equipment, which automatically diverts the water from the jets whenever the speed of the turbine increases more than 20 per cent. above the normal rate. The turbines are direct coupled

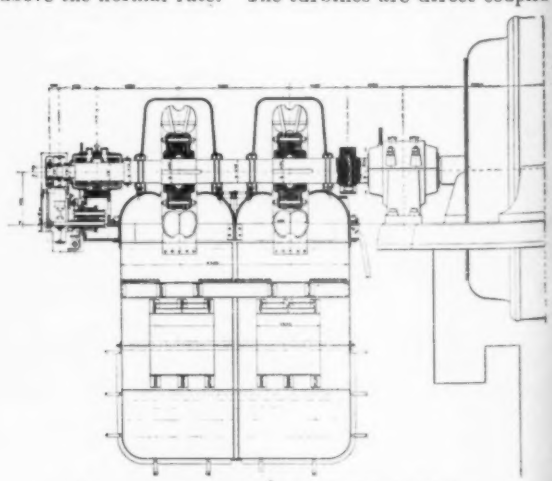


Fig. 5.—Section of 14,300 h.p. Twin-wheel Turbine.

to Oerlikon six-pole totally-enclosed alternators generating single-phase current at 15,000 V, which is stepped up to 60,000 V by 10,000- and 5,000-kVA oil-immersed core-type transformers.

Fig. 3 is a view of the interior of the turbine room, and fig. 4 shows one of the turbines, with the twin wheels suspended, during erection, while fig. 5 is a section of one of the twin Pelton wheels.

t possible
e disk.
uyere of
n can be
re of the
turbines
he needle
ıter ends
re servo-
dle valve
mounted
regula-
ve in all
n closing
arrange-
es should
control is
ne jet, by
diverted
crease of
lependent

he

erruption
ble-action
means of
r is auto-
tic speed
ich auto-
whenever
per cent.
t coupled

e.

rs gener-
is stepped
immersed

ine room,
the twin
g. 5 is a

Lighting and Power Notes.

(*Continued from page 578.*)

Special Orders.—The Electricity Commissioners have submitted to the Minister of Transport for confirmation Special Orders made by them authorising the Western Electric Distributing Corporation, Ltd., to supply electricity within parts of the rural districts of Bath and Frome; and the Lancashire Electric Power Co., for the supply of electricity in the urban district of Leyland.

The Gwynedd Trust, Ltd., has applied to the Commissioners for an amendment of the Flint and Holywell District Electricity Order so as to include the parish of Gwaensygor.

Spenborough. — PROPOSED CHANGE-OVER.—Application is being made for sanction to borrow £5,000 for the change-over of the system of supply to a.c. for the whole area.

Straits Settlements.—SINGAPORE.—According to *Eastern Engineering*, in his report for the year 1924, Mr. W. S. Dunn, municipal engineer, states that the scheme for the replacement of street oil lamps by electric lamps was completed during the year. The cost of public street lighting was $105,358, and in addition to this, $2,310 was expended on the purchase of lamp posts.

Stone.—ELECTRICITY IN BULK.—The Urban District Council is arranging with the Stoke-on-Trent Corporation for a bulk supply of electricity.

Stoke.—LOANS SANCTIONED.—The Electricity Committee has received sanction to loans of £6,000 for electricity mains and switchgear in connection with a supply in the Fenton district; and £2,650 for buildings and equipment.

United States.—ELECTRICAL DEVELOPMENT.—According to *Power*, the new central steam-power station built on the Broad River at Parr Shoals, S. C., by the Broad River Power Co., was recently inaugurated. The first section, the construction of which was started last November, has been completed at a cost of $3,000,000, with an extensive system of h.p. transmission lines. The plant, which has been designed for an ultimate capacity of 85,000 h.p., will furnish a supply in Columbia and Spartanburg and throughout Central South Carolina. Powdered fuel is being employed at this station.

In order to meet the increased demand for power at Baltimore, the Consolidated Gas, Electric Light and Power Co. has started on the erection of a steam generating plant planned some time ago. The new station will be ready for operation in about a year, and will be designed for four 36,000-kW turbo-generators. Only one of these sets, however, is to be included in the first installation.

Wimbledon.—LOAN SANCTIONED.—The Electricity Committee has received sanction to borrow £10,000 for the purchase of domestic appliances to be let out on hire.

Worthing.—INQUIRY.—Col. T. C. Ekin, on behalf of the Electricity Commissioners, held an inquiry at the Town Hall on September 29th into the applications of the Corporation and East Preston Rural District Council for Orders to supply electricity in the rural district of East Preston. For the Corporation it was stated that it was proposed to make a charge of 6½d. per kWh for lighting, which was the same as that charged in the borough, and that the Rural Council could not give a supply at such a low rate. For the Rural District Council it was suggested that it should have control of the development of electricity in its area. It was proposed to obtain a bulk supply from Worthing and to retail it at 8d. per kWh for lighting and 2½d. per kWh for power and heating. The Corporation stated that it was not prepared to give a bulk supply. The Commissioners will intimate their decision in due course.

Tramway and Railway Notes.

Belgian Congo.—RAILWAY ELECTRIFICATION.—According to *The Times Trade and Engineering Supplement*, the Technical Committee appointed a year ago to study the proposal to electrify the railway from Matadi to Kinshasa has reported in favour of immediate electrification. The Mpozo falls would be utilised to generate energy for the coastal section of 100 km. and if the necessary arrangements can be made in time to permit work to be begun at the termination of the next rainy season, it is believed that the electrification of this portion of the line could be completed by the end of 1928. This initial programme would be followed by the conversion of the remainder of the line, the Inkisi falls being harnessed to provide the necessary power. It is estimated that the electrification of the entire line would occupy six years. The Congo railway is 400 km. in length.

Bradford.—YEAR'S WORKING.—The report on the working of the Corporation tramway undertaking (manager: Mr. R. H. Wilkinson) for the year ended March 31st last shows a total revenue of £628,263, as compared with £619,581 in the preceding year. Working expenses amounted to £486,893, as against £486,449, leaving a gross surplus of £141,371 (£133,132). After deducting capital charges there was a net surplus of £51,846. The income from the railless-car service was £21,371, and the final result was a deficit of £5,315. There was a net surplus of £601 from the Parcels Department. The total net surplus from the three undertakings was £47,132, which was appropriated as follows: Contribution to capital account, £18,000; reserve or renewals fund, £16,132; rate relief, £13,000. The amount spent on track renewals during the year was £134,591, of which £120,796 was charged to capital account and the remainder appropriated from revenue. The number of passengers carried by the tramway and railless-car services increased from 92,683,421 to 100,150,739, and the car-miles run from 6,863,348 to 7,045,762.

MOTOR OMNIBUSES.—A special sub-committee of the Corporation Tramways Committee, appointed to consider the possibility of running 'bus services between tramway routes, has recommended the purchase of twenty-four motor 'buses, at an estimated cost of £1,500 each.

Blackpool.—TRACK RENEWALS.—The tramway track between the Cabin and Bispham on the Fleetwood section is to be re-laid to enable the present promenade service to be extended to Bispham. The cost is estimated at £7,395.

Continental.—BELGIUM.—The French Dyle et Bacalam Company recently made application to the Belgian Ministry for Railways for a concession to construct three metropolitan lines in Brussels. This has now been followed by the Société Générale de Chemins de Fer Economiques, which has offered to construct the permanent-way of a network of metropolitan lines at the cost of the conceding authority on condition of being granted a working concession for the three lines proposed, of a total length of 8.7 miles, capable of being ultimately extended to 21 miles. In addition, the same company has offered to construct a tunnel with a double line of normal gauge to connect the Northern and Southern railway stations at the cost of the State.

SWITZERLAND.—Plans have been prepared for the electrification of the Rorsbach-Heiden mountain railway.

GERMANY.—A preliminary concession has been granted in respect of a projected electric tramway between Falkenstein and Rodewisch, Saxony.

RUMANIA.—The Bucharest Tramway Co. is reported to have placed a contract with a Belgian concern for the electrification of its tramway system and for the construction of several new lines in the city of Bucharest.

SWEDEN.—Application is being made by the Swedish State Railways for a grant of 3,050,000 kr. for the electrification of the western main line. The line near Stockholm is also to be reconstructed.

London.—UNDERGROUND STATION IMPROVEMENTS.—Three of the five new "comb" escalators at Tottenham Court Road were put into service on September 29th, and the dismantling of the eight lifts was commenced. The space now occupied by the lifts will be used for the provision of a large booking hall. The scheme of improvements provides for the merging of the Hampstead and Central London stations into one large station. The number of passengers dealt with at the Tottenham Court Road stations in 1924 amounted to 20,000,000, and the improvements will allow for an increase of 50 per cent. in the annual traffic.

Straits Settlements.—PENANG HILLS RAILWAY.—We have received from Mr. W. J. Williams, engineer and manager of the Penang municipal electricity supply and tramway undertakings, a copy of his report, together with the statement of accounts, on the working of the Penang Hills Railway for the year ended December 31st last. The total revenue amounted to $63,818, and working expenses were $55,446, leaving a gross profit of $8,372, to which was added $7,070 brought forward at December, 1923, and interest of $79, making a total of $15,521. Of this amount $13,741 was appropriated for expenditure on construction during 1924, leaving a balance of $1,780. This railway was opened for traffic on October 21st, 1923, and the capital expenditure to that date was $1,489,130. Additional expenditure on construction amounted to $1,130 during 1923, and $69,449 during 1924, making a total of $1,559,709. The number of passengers carried during the year under review was 81,900, and the car-mileage was 12,927.

Wallasey.—TRACK RENEWALS.—The Tramways Committee has had under consideration a report submitted by the borough engineer on the reconstruction of the tramway track in various parts of the district. The estimated total cost of the scheme, to be spread over eight years, is £194,850. The Committee has recommended the Council to proceed with the first section of the work from Liscard Village to Mount Pleasant Road at a cost of £16,500.

Telegraph and Telephone Notes.

Australia.—"BEAM" RADIO STATIONS.—A resolution was proposed by Mr. G. A. L. Green (South Africa) at the Imperial Press Conference, which is being held in Australia, urgently impressing on the Imperial Government the necessity of expediting the completion of "beam" stations in England, and was carried. According to the *Financial Times*, Mr. Bruce, Federal Prime Minister, strongly protested against the refusal of the British Government to permit Australia to control a reciprocal "beam" station in Great Britain. Australia, he said, demanded the same privileges as were granted to Canada, foreign countries, and the cable companies.

China.—TELEGRAPH OPERATORS' STRIKE.—The operators of the Chinese Telegraph Administration struck work last week. They are demanding increased pay and better treatment.—*Reuter* (Shanghai).

NEW RADIO STATION.—It is reported that Messrs. C. Lorenz and Co., of Tempelhof, Berlin, have lately secured a contract for the equipment of a wireless station at Canton for ship communication purposes.

Czecho-Slovakia.—AUTOMATIC TELEPHONY.—Work is well in hand on the conversion of the telephone exchange in Prague to automatic operation on the Siemens and Halske system. Out of 12,000 subscribers' lines, about 4,000 are now worked automatically, the apparatus having been supplied by the Telegrafia Co., of Pardubitz.

Post Office Revenue.—TREASURY RETURNS.—The Treasury returns for the first half of the financial year indicate that the revenue of the telegraph service amounted to £2,600,000, a decrease of £100,000 as compared with the corresponding period last year; the income of the telephone undertaking was £7,750,000, an increase of £50,000.

The Telephone Service.—EXCHANGE NAMES.—In anticipation of the coming change to automatic switching, three telephone exchanges were renamed on October 1st: East Ham became Grangewood, Kingsbury is now Colindale, and Woodford has become Buckhurst. The new Sloane exchange also had the bulk of its subscribers allotted to it from four other exchanges.

Radio Notes.

Daventry.—AERIAL FAULT.—A breakdown of the aerial at the B.B. Co.'s high-power station (5 XX) on September 30th caused the afternoon programme to be interrupted for a time. The fault was soon rectified. The usefulness of the station was increased as from October 1st by an extension of the hours of broadcasting. For a period of one month as an experiment it will transmit additional programmes from 11 a.m. to 2 p.m. daily, except on Saturdays and Sundays.

Geneva Conference.—TOO MANY STATIONS.—Changes in the conduct of broadcasting in Europe are foreshadowed as a result of the International Wireless Conference which has just been held in Geneva. According to *The Times*, delegates to the conference are agreed that Europe has more broadcasting stations than can be possibly fitted into any wave band which the Governments of Europe are ever likely to set aside for broadcast purposes. It is felt that instead of having the present large number of comparatively low-power stations, Europe in the future must have fewer and more powerful transmitters. It was realised from the beginning of the Geneva Conference that there were not sufficient separate positions in the broadcast wavebands to give to every station a place to itself. Some stations had to be put on the same wavelengths. This part of the scheme was governed by geographical considerations, the power used by any two stations, and their distance apart. All sorts ot adjustments were made during the recent tests, but this part of the plan was a failure. Sooner or later each station must have its own wavelength. Meanwhile something must be done to keep the present cause of interference between the stations of Europe to the least harmful limits. The conference decided on a temporary plan, which differs in many respects from that on which the recent tests were based. The new scheme will come into operation about November 1st. Another meeting of the board will take place in December. Additional details of the scheme will be announced as they are arranged by the permanent staff at Geneva. New stations will be given positions below 200 metres.

Imperial Press Conference.—BROADCASTING COMMITTEE.—At the Imperial Press Conference, which is being held this year in Australia, Sir Percival Phillips (Great Britain) opened the discussion on broadcasting. He said that there seemed to be a prospect that broadcasting would conflict with the interests of the newspapers. Mr. C. F. Crandall (Canada) moved the appointment of a special committee of the Empire Press Union to keep in touch with the Dominions in order to watch the course of broadcasting. The resolution was carried.

Irish Free State.—APPOINTMENT OF BROADCASTING OFFICIALS.—The Ministry for Posts and Telegraphs has, according to the *Wireless Trader*, invited applications for the following positions in connection with the new broadcasting station at Dublin:—Station director, assistant engineer, musical director, and announcer. The salaries are £750, £300, £400, and £250 per annum respectively, and it is believed that the appointments will be made sometime during this month. The posts of musical director and announcer will be part time, and all positions will be non-pensionable. The appointments will be made by a Selection Board, acting under the Civil Service Regulations Act, and will be for a period of one year, and subject to termination at a month's notice.

SELECTION COMMITTEE.—Mr. J. C. W. Reith, managing director of the B.B.C., and Sir Hamilton Harty have been appointed to the Selection Committee which will draw up a scheme and make recommendations to the Free State Government in respect of all aspects of its broadcasting organisation. The Committee consists of officials appointed by the Free State Civil Service Commission. All the members are of Irish birth with the exception of Mr. Reith, and the B.B.C. is co-operating with the Free State Government in order that the broadcasting service in Southern Ireland shall be started on a firm foundation. The first meeting of the Committee will be held in Dublin on October 13th, and it will deal with the appointment of the staff.—*Manchester Guardian.*

Italy.—NEW STATION.—Owing to an error in a Marconi communication, it was stated last month that the company was erecting a broadcasting station in Milan. The facts are that it has received an order for a broadcasting station in Rome of a larger power than the one which was erected by it there some time ago, and which is now working. As soon as the larger station, which will be of 12 kW, is in operation, the smaller, a 6-kW station, will, we understand, be removed to Naples.

New Zealand.—NEW STATION.—Figures made public last June show that there were just over 4,200 holders of listening licences in New Zealand. Until the 500-watt station of the broadcasting company is ready to begin service, the Government has authorised existing stations to carry on, and is subsidising them, says the *Australian Electrical Times*. Auckland's broadcasting station (IYA) has taken the call sign VLAK and wave-length of 420 metres. With a subsidy of £15 per week from the Postal Department and £15 from traders, and under the supervision of a local committee representing, as well as the company, the trade Postal Department, and listeners, an improved service is promised.

Contracts Open and Closed.

(The date given in parentheses at the end of the paragraph indicates the issue of the "Electrical Review" in which the "Official Notice" appeared in our advertisement pages.)

Open.

Ashford (Kent).—Urban District Council. Electricity meters. (October 2nd.)

Australia. — MELBOURNE. — December 1st. Postmaster-General's Department. Motor-generator sets for charging secondary batteries. (October 2nd.)

SYDNEY.—December 16th. New South Wales Government Railways and Tramways. 10 single-phase, 1,800-kVA transformers.*

Belfast. — November 2nd. Electricity Department. Motor-generator and transformer. (See this issue.)

Belgium.—October 31st. Association Liegoise d'Electricité, 33, Rue Darchis, Liege. Supply of electricity distribution mains in the communes of Horion-Hozemont, Awans, Xhendremael, Houtain-Saint-Simeon, Hermée, and Vottem. Particulars from above address.

Bristol.—October 19th. Port of Bristol Authority. Two 2-ton electric capstans. Specification from the General Manager and Secretary, 19, Queen Square, Bristol.

Dartford.—October 17th. Electricity Works. Small steam coal for 6 or 12 months. (See this issue.)

Dublin.—Electricity Department. Transformers for one year. City Electrical Engineer, Fleet Street, Dublin.

Dublin Borough Commissioners. Electric wiring of 416 houses at Croydon Park. City Architect, Exchange Buildings, Lord Edward Street, Dublin.

Edinburgh.—October 16th. Corporation. 12 electric tramcar trucks, electrical equipment of cars, and air-brake equipment. Specifications from the manager.

October 13th. Electricity Department. Cables, conduits, pavement box frames and covers, fuse boxes, meters, meter boards, &c. (See this issue.)

Edmonton.—October 13th. Board of Guardians. Electric lighting and power installations at Enfield House. (September 25th.)

Egypt.—CAIRO.—December 1st. Ministry of Public Works. Two pumping units and accessories for the Mex pumping station.*

Glasgow.—October 19th. Parish Council and District Board of Control. Stores, including electrical fittings, for six months. Forms of tender from Mr. M. A. Reynard, inspector and clerk, 266, George Street.

Leeds.—October 20th. Tramway Department. 150 double-deck top-covered tramcars complete, or, alternatively, 150 tramcar bodies, 190 tramcar trucks, including wheels and axles, 190 tramcar electrical equipments. (October 2nd.)

Lichfield. — October 19th. Electricity Department. Transformers, switchgear, and cable connections; e.h.p. and l.p. cables, boxes, and roadwork; e.h.p. overhead transmission line. (September 25th.)

London.—ISLINGTON.—November 11th. Electricity Department. 3-phase, 6,000/6,600-V and two-phase or single-phase 2,500/2,000-V switchgear and accessories. (September 25th.)

H.M. OFFICE OF WORKS.—October 14th. Dismantling wiring and rewiring in conduit at Charity Commissioners' office, Ryder Street, W. (September 25th.)

Manchester.—October 13th. Electricity Committee. Twelve months' supply of wooden cable troughing, capping, and boards. Form of tender from Mr. H. C. Lamb, manager, Electricity Department.

Newport (Mon.).—October 28th. Electricity Department. Electrically-driven pumps, pipework, valves, &c.; switchgear; water-screening plant. (October 2nd.)

New Zealand.—WELLINGTON.—Public Works Department. December 8th. Steel transmission line supports for the Waikato power scheme.*

Sheffield.—October 20th. Tramways and Motor Department. 50 double-deck vestibule tramcars. (See this issue.)

Sleaford. — October 20th. Electricity Department. Cables, &c. (See this issue.)

South Africa.—CAPE TOWN.—October 14th. Electricity Department. Electric motors.*

Southend-on-Sea.—Light Railways and Electricity Department. House-service meters and demand indicators. (October 2nd.)

Uruguay. — MONTEVIDEO.—December 22nd. State Electricity Supply Works. 200,000 metres r.i. wires and cables. December 28th. 1,060,000 metres of special cable for outside use.

November 27th. H. and l.p. cables and accessories.*

Wakefield.—October 12th. West Riding County Council. Equipment of central repair shop at Thornes, including electric motors and engineering workshop equipment. Particulars from West Riding county surveyor, County Hall, Wakefield.

*Further particulars can be obtained at the Department of Overseas Trade (Inquiry Room), 35, Old Queen Street, S.W.1.

Closed.

Argentina.—The tender of Tilling-Stevens Motors, Ltd., for the supply of 100 petrol-electric omnibuses for service in and around the city of Buenos Aires was, *Modern Transport* states, accepted last week.

Australia.—MELBOURNE.—Victorian State Electricity Commission. Accepted :—

Nineteen 3,000-kVA single-phase transformers.—Johnson & Phillips, Ltd.

Barking.—Electricity Committee. Accepted :—

Motor converters (£4,950).—Ateliers de Constructions Electriques de Charleroi.
H.p. switchgear (£2,683).—A. Reyrolle & Co., Ltd.
D.c. switchgear (£3,718).—Bertram Thomas.

Tramway Committee. Accepted :—

Rails (£80).—Cargo Fleet Iron Co., Ltd.

Birkenhead.—Electricity Committee. Accepted:—

4-core l.p. cable (£3,430).—Hackbridge Cable Co., Ltd.
3-core e.h.p. cable (£1,750).—British Insulated & Helsby Cables, Ltd.
L.p. service cable (£1,085).—Liverpool Electric Cable Co., Ltd.

Bournemouth.—Corporation. Accepted:—

20 tramcars and equipment (£52,320).—Metropolitan-Vickers Electrical Co., Ltd., and the Brush Electrical Engineering Co., Ltd.—*The Times.*

Croydon.—Board of Guardians. Accepted:—

Electrical fittings and appliances for six months.—J. & T. Robinson.

Dundee.—Housing Committee. Accepted:—

Electric lighting installation at Corporation houses (£109).—Marshall, Hutton & Co.

Erith.—Housing Committee. Recommended:—

Installing electric light at 100 houses (£662).—Erith Electrical Co., Ltd. The other tenders received were: E. E. Beaven (£10 13s. 4d., or £9 16s. 9d. per house); Dean & Davis (£9 14s. per house); Electrical Supply Stores (£733); W. Dickinson & Co. (£895).

Germany.—We are informed that the Lopulco pulverised fuel system, the rights of which belong to International Combustion, Ltd., of London, is to be installed in a new boiler house of the Berlin Electric Light Works on 12 large boilers. It is understood that this order has been secured in face of exacting investigations by German engineers into all known Continental and American systems of pulverised fuel.

Hull.—Telephones Committee. Accepted:—

Cable (£101).—Union Cable Co., Ltd.
Bronze wire (£321).—T. Bolton & Sons.
Telephone cords (£82).—British L. M. Ericsson Manufacturing Co., Ltd.

Keighley.—Corporation. Accepted:—

Installation of electric lighting in 50 houses on the Broomhill estate.—Ideal Electric Co.

Board of Guardians. Accepted :—

Electrical installation at St. John's Hospital and the Central Children's Homes.—Ideal Electric Co.

Lanarkshire.—

Electric lighting installation, &c., in the operating theatre and X-ray block at the County Sanatorium, Stonehouse (£991).—Telford, Grier and Mackay, Ltd.

London.—GENERAL POST OFFICE.—*The Times* says the Postmaster-General has placed with a British firm a large order for battery glass jars for the telephone department. An undertaking has been given that the jars will be made in this country. It is stated that the number of jars ordered runs into six figures.

Portsmouth.—Board of Guardians. Accepted:—

Electrical stores.—H. A. Evans.
Electric lamps.—Stella Lamp Co., Ltd.

Meter Contracts.—Brighouse Urban District Council, Clyde Valley Electric Power Co., and the Borough of Kirkcaldy have placed contracts for electricity meters with Edison Swan Electric Co., Ltd.

Salford.—Tramways Committee. Accepted:—

Special trackwork.—Hadfields, Ltd. (£338); Thermit, Ltd. (£441).

Health Committee. Accepted :—

Wireless reception apparatus for Nab Top Sanatorium (£145).—Marconiphone Co., Ltd.

Shipley.—Health Committee. Recommended:—

Electric light installation at smallpox hospital (£179).—G. Binns.

Stoke-on-Trent.—Corporation. Accepted:—

Wiring central power house extension (£1,068).—Hamley & Ingram.

Electricity Committee. Accepted :—

Erection of eight all-electric houses (£4,500).—Maddock Bros.
E.h.p. testing set (£119).—British Electric Transformer Co., Ltd.

Wimbledon.—Electricity Committee. Recommended:—

3,000-kW turbo-alternator (£16,499).—Metropolitan-Vickers Electrical Co., Ltd.

York.—Education Committee. Accepted:—

Re-wiring at Queen Anne School (£187).—Electricity Committee.

Forthcoming Events.

Electrical Trades Commercial Travellers' Association.—Saturday, October 10th. At the Manchester Hotel, Aldersgate Street, E.C. At 7.30 p.m. Bohemian concert.

Junior Institution of Engineers.—Tuesday, October 13th. At 39, Victoria Street, E.C. At 7.30 p.m. Paper on "Town Planning: its Effect and Influence on Industry," by Mr. R. A. Hudson
Friday, October 16th. Lecturette, "Super-Tension Cable Dielectrics," by Mr. A. J. Tracey.

Institution of Civil Engineers.—Wednesday, October 14th. At the Institution of Civil Engineers, Great George Street, S.W. At 6 p.m. Joint meeting with the bodies which are co-operating in the work of the Special Committee on tabulating the results of heat-engine trials. Discussion on "Standard Codes for Tabulating the Results of Trials on Steam Turbines and Condensing Plant," to be opened by Mr. R. A. Chattock.

Institution of Engineers-in-Charge.—Wednesday, October 14th. At St. Bride's Institute, Bride Lane, E.C. At 7.30 p.m. Presidential address by Engineer Vice-Admiral Sir Geo. G. Goodwin, K.C.B.

British Electrical Development Association.—CONFERENCES.—Thursday and Friday, October 15th and 16th. At E.L.M.A. Lighting Service Bureau. At 7.30 p.m.

Birmingham Electric Club.—Friday, October 16th. At the Grand Hotel, Colmore Row. At 7 p.m. Lecture on "Power Factor Improvement as Affecting the Economical Running of Works Plant," by Mr. F. C. Hall.

Institute of Transport (North-Western Section).—Friday, October 16th. At Lime Street Station Hotel, Liverpool. Paper on "Electrically-propelled Vehicles for Road Transport," by Mr. F. Ayton.

Electrical Power Engineers' Association (Southern Division).—Saturday, October 17th. At the Hotel Cecil, Strand, W.C. At 5.30 for 6 p.m. Annual dinner.

National Association of Supervising Electricians.—Saturday, October 18th. At Ye Mecca Restaurant, Ludgate Hill, E.C. Dinner and whist drive.

The "Electrical Review" Service Department.

INQUIRIES must be accompanied by a stamped addressed envelope.

We should be glad to learn the names of makers or suppliers of :—

IDEAL electric irons.

Notes.

Perlit Cast Iron.—There is now being introduced a process for the manufacture of cast iron which would seem to be of considerable significance. The process is not new, for it has been adopted on the Continent for some time; but, so far as this country is concerned, it has been practically investigated to a limited extent for some months by the North-Eastern Marine Engineering Co., a marine Diesel engine-building concern. The patent rights in this country have been acquired by the British Perlit Iron Co., Ltd. The *Motor Ship* has examined a number of Perlit castings, and can assert that within its experience nothing of a like nature has been produced in ordinary cast-iron practice. Quite apart from the homogeneous nature of the metal, it draws attention to the fact that it has handled twisted bars of Perlit cast-iron, lengthy turnings from the metal, cold-bent strips and other items, all of which prove conclusively that the process can render possible the production of castings of an extremely high quality and possessing unique properties.

Report on a Tramway Accident.—Major G. L. Hall has furnished the Minister of Transport with a report upon a tramway accident which occurred at East Dulwich on July 31st last. The cause of the mishap was the back-running of an L.C.C. tramcar after reaching the highest point of the steepest gradient on Dog-Kennel Hill. The car collided at the foot of the hill with another which was standing there. There were 38 cases of personal injury, and a number of persons complained of shock. None of the cases was serious. It appears that the motorman inadvertently omitted to change over the reversing key before applying the magnetic brake, and so lost control of the car. Major Hall says that it is possible to obviate the necessity for changing over the reversing key before the application of the magnetic brake in the event of a run-back by an alteration in the standard connections between the armatures and fields of motors, but it is considered that the system introduces drawbacks so serious as to outweigh any advantage which may be gained.

A True Fish Story.—The *Electrical World* says that tons of dead and stunned fish recently lodged against the dam of the Interstate Public Service power house near Bedford, Ind., blocking the wheel pits and causing some of the wheels to be closed down. The entire countryside carried and hauled fish away. One fish weighed eighty-four pounds and a number weighed more than fifty pounds. Employés of the company in boats were kept working to prevent the trash racks from becoming clogged.

Industrial Heating in the United States.—According to a writer in the *Westinghouse International*, the industrial heating load in the United States now amounts to about one million kW, representing about one-tenth of the total load. This is distributed as follows:—Steel melting furnaces, 225,000 kW; brass melting furnaces, 95,000 kW; heat treating furnaces, 85,000 kW; industrial ovens, 200,000 kW; bread baking and commercial cooking, 100,000 kW; welding, 55,000 kW; and miscellaneous small units, 325,000 kW. It is stated that 95 per cent. of the japanning ovens in use in the automobile industry are electrically heated.

Electric Wiring in New Zealand: Registration of Linesmen.—A correspondent in New Zealand has sent us the following extract from *The Dominion* of August 15th, suggesting that it will give a hint to intending "wiremen immigrants" and others to the effect that unless they qualify by examination they may have to work as labourers. The same thing applies to plumbers and painters:—

New provisions for the control of electric wiring in New Zealand are contained in the Electrical Wiremen's Registration Bill. The Bill provides for the establishment of a Registration Board, consisting of five members, who will conduct examinations, issue certificates, receive applications for registration and authorise the same in cases where the conditions of registration have been complied with. An applicant may register on payment of the prescribed fee if he has received satisfactory training as an electrical wireman and is the holder of a certificate granted after an examination in both theoretical and practical wiring, or at the commencement of the Act is the holder of a certificate or licence as an electric wireman issued by an electrical supply authority approved by the Board. A further provision enables the Board to register a person who, although he is not the holder of a certificate or licence or has not passed the prescribed examination, is competent to perform the duties of an electrical wireman. A provisional licence may be granted for a period not exceeding six months to any person not qualified to be registered under the Act, and on application being made within a month of the expiry of the licence, the Board may register the person as an electrical wireman, if it is satisfied that the applicant has been employed as such for at least three years previously. Registered electrical engineers may do electrical wiring work or be appointed as inspectors, and are subject to the Board's power to suspend them for defects. The wiring of any premises for electric lighting, heating, and power purposes is to be undertaken by or under the direct supervision of a registered electrical wireman. Electricity supply authorities are empowered to appoint inspectors to inspect all wiring work before it is connected with the source of supply, and report on any defects. Complaints against inspectors' decisions by a recognised body representing electrical traders may be investigated by a competent person appointed by the Board, and if the Board is satisfied that the inspection was unfairly made, it is empowered to suspend the inspector or cancel his registration. Power is given to appeal against any of the Board's decisions, the appeal to be heard by a magistrate and two assessors. A register is to be kept, and the Board has the power to suspend licences for proved complaints of defective workmanship.

Street Traffic Signals. — A system of co-ordinating the control of cross-streams of vehicular traffic in main thoroughfares by means of electrically-operated signals is to be considered by the London Traffic Advisory Committee.

Parliamentary Acoustics.—With a view to improving the acoustics of the debating chamber of the House of Lords, preliminary tests were carried out recently with a variety of sound-producing and magnifying appliances. The apparatus was inspected by officials from the Office of Works. Tests were made with a single microphone placed on the central table of the Chamber and with headphones attached to the Lords' benches, and satisfactory amplification of voices was reported from all parts of the chamber. In some cases the speaker was located 15 ft. from the microphone.—*Daily Telegraph.*

The Ilford Cable Contract.—The recommendation of the Ilford Electricity Committee that a contract for 14 miles of cable be placed with a German company (ELEC. REV., October 2nd, p. 542) was recently adopted by the Council, and some attention has been given to the matter in the daily Press. The Council is credited with the object of breaking a "ring" of British cable-makers, and with the intention of saving money for the ratepayers. The German price is stated to be 13 per cent. lower than the lowest British tender. The *Morning Post* interviewed the electrical engineer at Ilford, and attributes to that gentleman what seems to us to be the remarkable opinion that of the total amount of money involved, £4,000, not more than some 3 per cent. would have gone in wages if the contract had been placed here. It was, he said, incorrect to suggest that the Council was opposed to the firms which constituted the Cable Makers' Association. It was, however, a singular fact that all British quotations were, within a fraction of a penny per yard, identical, and when a foreign firm quoted a much smaller figure it was bound to be accepted by the Council unless there was something radically wrong with the firm; the fact that it was a German concern could not be regarded in itself as sufficient grounds for rejecting its favourable tender.

The *Morning Post* states that the action of the Ilford Council was severely criticised by an official of one of the largest firms of cable manufacturers in the country, who are members of the Cable Makers' Association. "We in England," he said, "have to pay full Trade Union wages, which are at present something like 40 per cent. higher than those paid in Germany; a year ago they were over 60 per cent. higher. When the Ilford Council called for tenders for the cable in question it inserted the usual clause insisting that Trade Union rates of wages and length of working hours should be adhered to. This obviously goes by the board now that the contract has been placed in Germany. British firms are overburdened with high rates in consequence of the large number of unemployed, involving the payment of unemployment benefit and relief. Germany avoids all this by securing at lower prices contracts which should be kept in the country. It is difficult to overcome such unfair competition."

The following communication on the subject has reached us at the moment of going to Press:—

"The Ilford Council are to be congratulated on their courageous attempt to break the ring of electrical cable manufacturers by placing an order for cable with a German firm. It is interesting to note that there are ratepayers who have the commonsense to see that what they might save on "doles" is more than counterbalanced by the extra prices demanded by the rings for their manufactures. There are, of course, other rings apart from cable-makers, which, in the happy position of knowing that municipalities dare not place orders abroad, naturally exploit public undertakings to their own advantage. The ratepayer is thereby indirectly *subsidising the home manufacturer*, but, as usual, he has dust thrown into his eyes on the plea of unemployment. Nobody, of course, would suggest placing all orders abroad, but it is high time the community refused to be coerced by the combines in order to subsidise profiteers and shareholders. It is to be hoped that other municipalities will follow the lead of Ilford and thus help to eliminate one of the main causes of our industrial unrest."

October 5th, 1925. "SALES ENGINEER."

Appointments Vacant.—Electrical engineering draughtsman (£315) for the Metropolitan Asylums Board. Plumber-jointer for Prescall U.D.C. electricity department. Plumber-jointer for Salford Corporation electricity department. (See our advertisement pages to-day.)

Builth Wells Electricity Undertaking.—The electricity undertaking at Builth Wells, which was inaugurated on September 19th by Mrs. Black Jones (ELECTRICAL REVIEW, October 2nd), is the outcome of the formation of a company under the chairmanship of Dr. Black Jones which had previously explored the neighbourhood of the town to ascertain whether water power could be utilised for generating electricity. Observations over a long period showed that the power available was liable to very wide fluctuations, and estimates of the cost proved that the expenditure of capital would be excessive. In 1924 it was decided to erect a generating station in the town, and a convenient central site was found. The power house is of steel and concrete construction. The plant includes a Ruston-Hornsby horizontal semi-Diesel oil engine driving a 40-kW d.c., 230-V generator. Provision is made for a second generating set. A switchboard supplied by the Austin Lighting Co. is equipped with pressure-regulating apparatus. A 600-Ah battery of Messrs. Pritchett & Gold & E.P.S. Co.'s manufacture is also installed. The exhaust pipe from the engine passes underneath the oil-storage tank to prevent the oil becoming too viscous in the winter. The cooling water for the cylinder jacket is pumped from a sump to an overhead tank and flows through the jacket by gravity. The distribution of current is effected by means of overhead ring mains.

Where the mains cross the lines of the Post Office, the copper cables are covered with P. B. J. insulation, thus avoiding the use of unsightly wire cradles. The steel transmission poles, which were supplied by the British Mannesmann Tube Co., are of the one-piece stepped pattern, and are made of high-tensile steel. Builth Wells is an instance of a town which is out of reach of any bulk supply, and is obliged to generate its own energy. The design and erection of the undertaking have been carried out by and under the supervision of Messrs. Moffett, Rosher & Mann, consulting engineers, Birmingham.

Nottingham's Electricity Supply.—The temporary dislocation in Nottingham's electricity supply, which took place recently, was referred to at a meeting of the City Council on Monday last. Ald. E. Huntsman, chairman of the Electricity Committee, said that the whole of the plant in the North Wilford power station was tested thoroughly before being put into service. A system of protection was provided to guard against overloading on the main cables, and it was necessary that the relay apparatus at both ends of the line should be of the same make and the same class. Plans were supplied to the men who had to carry out the work, but they failed to understand certain marks on the plans when installing the apparatus, and the omission could not be detected until the plant was put into operation. Investigations showed that that was the cause of the trouble. When the current was cut off, every effort was made to restore it as quickly as possible, and plant was put in which was not properly equipped with balancers; that was the reason for fusing in certain parts and for certain lamps being burnt out. They had got the very best plant, and they had now safely got over the transition.

Electrical Association for Women.—Lecturers have been supplied by the Association to other women's organisations, namely: For the St. John's Fellowship meeting on October 6th, at 54a, Tottenham Court Road, London, at 8 p.m. Subject: "Making the Home Electric." Speaker: Miss E. E. Wilson (member, E.A.W. Council); for the Hastings and St. Leonards Women Citizens' Association on November 20th, at 3 p.m. Public meeting on "Electricity in the Service of Women." Speaker: Miss C. Haslett (director, E.A.W.); and for the Dulwich Women Citizens' Association on December 8th, at 3 p.m. Subject: "Electricity in the Service of Women." Speaker: Alderman Mrs. Hammer (chairman, E.A.W.).

Fatalities.—At Dunfermline recently an inquiry was held into the death of an electrician employed at the power station of the Aitken Pit, Kelty, from a shock received by coming into contact with a "live" cable. An electrical engineer stated that he and the deceased had completed some work and were testing it. They found difficulty in getting the current into phase. In the course of experiments in order to find out what was wrong he heard the sound of an explosion and saw that the place was in flames. He found deceased lying on the floor. There had been some mistake in connecting up which they had not known about. The accident might have been due to deceased temporarily forgetting the possibility that the metal parts were alive, or he might have stumbled.

Questioned by the agent of the Fife Coal Company, witness stated that what was being done was a recognised operation for certain purposes, and was always associated with a certain amount of risk. None but skilled men were employed in connection with such an operation.

The Sheriff said that he did not think that it was possible to ascertain exactly how the accident happened, and without knowing that, it was impossible to make any suggestion for preventing a similar accident in the future. The jury returned a formal verdict.

A woman named Matilda Cayer, aged 68, of Rice Lane, Liverpool, who had booked an excursion ticket to Southport, fell on the electric railway at Walton Junction station on Friday last and was killed, receiving an electric shock and being struck by an incoming train.

Electrical Plant at the Southampton Docks.—In the note in our issue of September 25th (p. 506) upon the plant supplied to the Southampton Docks by Messrs. Mather & Platt, Ltd., we stated that the pumps shown provided the necessary hydraulic power for the pumps used for de-watering Nos. 1, 2, and 3 dry docks. The receiver and manager of Gwynnes Engineering Co., Ltd., which supplied the de-watering pumps, considers that our statement is misleading. He asks us to make it clear that the turbine pumps illustrated in our note actually provide hydraulic power for the operation of the sluice valves on the de-watering pumps.

The Manchester Dance.—The Manchester Electrical Engineers' Dance will be held at the Midland Hotel, Manchester, on December 4th. Information respecting the arrangements may be obtained from Mr. J. Harcourt-Williams, National Buildings, St. Mary's Parsonage, Manchester, the hon. treasurer, or from Mr. George H. Fawcus, 29, Stamford New Road, Altrincham, the hon. secretary.

National Association of Supervising Electricians.—"ECONOMIC PREMIUMS."—Two cash prizes—one of £10 and the other of £5—are being offered to members of the Association by the president, Mr. F. Gill, M.Inst.C.E., M.I.E.E., for the best two papers dealing with economic questions. Rules have been drawn up, and papers must be received by the general secretary, N.A.S.E., not later than November 25th, 1925.

On Tuesday last, at the Junior Institution of Engineers, London, Mr. J. S. Highfield opened the new session, and called upon Mr. A. H. Dykes, in the unavoidable absence of the President, Mr. F. Gill, M.Inst.C.E., M.I.E.E., to read Mr. Gill's address. Three economic subjects were dealt with by the author. In the first place he commented on the multiplicity of patterns of accessories and materials that were used in electrical installation work, and suggested that the Board of Control of the Association should appoint a small committee to report on the subject and to make proposals for the elimination of superfluous varieties and the simplification of stocks. Next Mr. Gill referred to the prevention of accidents, and suggested that a "safety code" should be prepared with this end in view; and finally he discussed thrift, laying stress on its personal application and showing in detail the growth of savings at compound interest.

Bauxite in Hungary.—As a result of investigations carried out on behalf of the State by the Hungarian Geological Institute during the past year, special interest is said to have been evoked by the discovery of new deposits of bauxite in the Bakony and Vertes fields. The depth of the deposits is inconsiderable, and the degree of purity of the ore is declared to be greater than that of any other occurrence of bauxite. Working of the deposits is reported to have been begun already with the assistance of foreign capital.

The Norman Lockyer Lecture.—The first annual Norman Lockyer Lecture, established by the British Science Guild as a means of periodically directing the attention of the public to the influence of science upon human progress, will be given by Sir Oliver Lodge, F.R.S., on Monday, November 16th, 1925, at 4 p.m. The subject of the lecture will be: "The Link Between Matter and Matter." Lord Askwith, K.C.B., K.C., President of the Guild, will be in the chair, and the lecture will be given in the Hall of the Goldsmiths' Company. Tickets of admission may be obtained on application to the Secretary, British Science Guild, 6, John Street, Adelphi, London, W.C.2.

Institution Notes.

Institute of Transport.—On Monday last, the first meeting of the Session was held at the Institution of Electrical Engineers. Sir Lynden Macassey, the retiring president, presented the premium awards, which included the Railway Engineering Gold Medal to Major C. H. W. Edmonds, for his paper on "Modern Traffic and Signalling," and the Water Transport Gold Medal to Mr. H. J. Deane for his paper on "Modern Dock Equipment." He then installed Col. Sir Joseph Nall, D.S.O., M.P., in the chair. In the course of his presidential address, Sir Joseph said that the membership of the Institute had increased during the past year from 1,977 to 2,374. Four Local Sections were in operation, a fifth was contemplated, and the establishment of branches in South Africa, Australia, India, and South America was under way. The first Institute examination was to be held in the spring of 1926. The address dealt mainly with the question of competition between rail and road transport, and the president, referring to the maintenance of paving by tramways, expressed the view that those who were concerned in road transport must be prepared to shoulder a due proportion of the cost of providing and maintaining the roads which they used. Road transport enjoyed heavy subsidies by way of road maintenance, and the roads and railways should be placed upon a more equitable basis. If justice was to be done, the law must be amended; he suggested that tramways should receive the same grant in aid from the Road Fund as would be paid to the road authority for that part of the road if the tramway did not exist. The present practice in the matter of omnibus licensing called for early revision.

Junior Institution of Engineers.—PROBLEMS OF BROADCASTING.—At the opening meeting of the session, Mr. E. Bishop, B.Sc., of the B.B.C., lectured on the subject of "Problems of Broadcasting," in the course of which he referred to a microphone which was in use, of the carbon type, which was giving good results and had great possibilities for the future, being entirely free from hisses. In connection with the arrangements for outside and simultaneous broadcasting, Mr. Bishop said that, contrary to ordinary commercial practice, an unloaded land line transmitted sounds better than one which was loaded, the reason being that radio sounds covered the whole range of audible frequencies and not merely the range of ordinary speech. The wireless link had been found impossible to use for any distant relay work. Future developments would probably lead to bigger stations and fewer of them, and more American and Continental transmissions.

Institution of Heating and Ventilating Engineers.—At the autumn meeting held on October 6th, Mr. E. Ower, B.Sc., A.C.G.I., of the National Physical Laboratory, read a paper on the measurement of air flow. The author treated the subject from an engineering standpoint, confining his attention to instruments and methods suitable for industrial use. He dealt at some length with the Pitot tube, both in its usual form and with modifications, explaining the conditions to be observed in designing alternative types for use in special cases. Dealing with manometers, he described three types suitable for factory work. For all-round usefulness combined with accuracy and ease of observation, he advocated the Krell form of inclined tube manometer. Reference was also made to a tilting micromanometer whose calibration could be calculated from a knowledge of its dimensions, and to a two-liquid gauge capable of giving a magnification of about 10 to 1. The orifice plate and Venturi tube were described, attention being drawn to the facts that these instruments gave rise to considerably larger pressure differences than the Pitot tube, and that they were eminently suited to the taking of continuous records of flow. The lecturer dealt also with the construction and use of vane anemometers, the calibration of manometers, and the testing of connections and instruments for leaks. In the latter connection he emphasised the necessity for testing all rubber leads, since even new rubber tubing sometimes showed traces of porosity.

Our Personal Column.

(Electrical men are invited to enable us to keep readers of the "Electrical Review" posted concerning their movements.)

COL. SIR JOSEPH NALL, D.S.O., T.D., M.P., who was inducted into the chair of the Institute of Transport on Monday last, is a director of the Llandudno and Colwyn Bay Electric Railway, Ltd.

The Railway Engineering gold medal was recently awarded by the Institute of Transport to Major C. H. W. EDMONDS, O.B.E., M.I.E.E., of the Westinghouse Brake & Saxby Signal Co., Ltd. Major Edmonds was a member of the Automatic Train Control and Light Signals Committees of the Ministry of Transport.

Major Basil Binyon, O.B.E., who is the new chairman of the Wireless Section of the Institution of Electrical Engineers, and whose portrait accompanies this note, was born at Ipswich in 1885. He was educated at Leighton Park School, and from there went to Trinity College, Cambridge. He took the Natural Science Tripos with distinction and the M.A. degree, and after a year of post-graduate engineering study, served a term in the shops of the Cambridge Scientific Instrument Co. He made his entry into the radio world in 1909 by joining the Lepel Wireless Syndicate, by which he was employed in the construction of a station in Jamaica. When

Elliott & Fry] [*London*

Major Basil Binyon, O.B.E., M.A.,

The new Chairman of the Wireless Section of the I.E.E.

the Lepel concern was taken over by the French Cie. Générale Radiotélégraphique, Mr. Binyon was appointed research engineer. In 1911 the French company set up an English agency, and Mr. Binyon was placed in charge of it. In addition to shipping work, he erected a number of land stations, including one at Borneo and another in the Bahamas. When the inquiry into the position of radio-telegraphy in the Empire was held by a Parliamentary committee, Mr. Binyon represented his company. Upon the outbreak of war he secured a commission in the R.N.V.R., and helped in developing aircraft signalling, and, incidentally, obtained a pilot's certificate. He continued with the Royal Air Force until 1919, when the Radio Communication Co. was formed, with Major Binyon as managing director. Under his guidance this company has made rapid progress, and is now a leader in the field of marine radio-telegraphy.

The Walsall Town Council has confirmed the appointment of Captain H. V. Morland, manager of the St. Helens Corporation Tramways, as tramway manager, at a salary of £800 per annum, rising by annual increments of £25 to £900.

According to the *Sydney Morning Herald*, the Sydney, New South Wales, City Council, at a meeting on August 18th, considered a recommendation of the electricity committee that Mr. Forbes Mackay, the chief electrical engineer, be granted an increase of £1,500 per annum, making his salary £3,500, owing to his additional responsibilities in the reconstruction of the new power house. The Council declined to approve of the £1,500 to Mr. Mackay as an increase of salary, and the Lord Mayor explained to the City Council that the £1,500 was only to cover Mr. Mackay's expenses in Britain for 12 months. Alderman Marks said the Lord Mayor's statement to the Council was entirely different from his recommendation to the committee. After considerable discussion it was agreed that the £1,500 be passed as an honorarium for 12 months only. The Lord Mayor promised that the question of permanent increase of salary would be further considered when Mr. Mackay returned from London, and that he (the Lord Mayor) would make a further recommendation in regard to Mr. Mackay's expenses. Mr. Mackay was to leave for London at the end of last month for the purpose of advising British tenderers for the new power house plant, which is expected to cost approximately £1,000,000.

Mr. C. H. McCarthy-Jones, M.I.E.E., M.I.Mech.E., consulting engineer, has accepted the appointment of manager to the Indian Radio Telegraph Co., Ltd., and sails for Bombay early in November to take up his new duties. His consulting practice has been assigned to Messrs. Murray Coombs and Richards, Premier House, 150, Southampton Row, W.C.1.

The staff of the Birmingham Electricity Supply Department have presented an oak clock to Mr. R. H. Rawll, district installation engineer, on the occasion of his marriage to Miss E. Hodges, of Stoke Newington.

Mr. J. S. Smith, late manager to Sterling Telephone and Electric Co., Ltd., Cardiff, has been appointed district manager to the Marconiphone Co., Ltd., 21, Mosley Street, Newcastle-on-Tyne.

Mr. Alan W. Andrews, Glasgow, has been appointed, from 110 applicants, manager of the Corporation of Alloa electricity undertaking, in succession to Mr. D. McLennan, now at Inverness.

Messrs. W. J. Furse & Co., Ltd., of Nottingham, have taken advantage of the occasion of the opening of the electrical exhibition there to present a gold hunter watch to their superintending engineer, Mr. H. Abdy, who was largely responsible for their exhibit, in recognition of his thirty years' continuous service with the company. Messrs. Furse take some pride in the fact that they are the oldest firm of electrical contractors exhibiting.

The *Industrial Australian and Mining Standard* states that Mr. J. E. Morwood, B.E., who, during the past two years, held an important position with the Brisbane Tramways, left Brisbane on August 16th for London. Mr. Morwood obtained first-class honours at the University of Brisbane in electrical engineering, and recently has been awarded the W. and E. Hall Travelling Fellowship, which provides for two years' travel in England, the Continent and America; on his return he will lecture at the University for 12 months.

Obituary.—Captain M. H. P. Riall Sankey.—We regret to state that Captain Matthew Henry Phineas Riall Sankey, C.B., C.B.E., R.E. (Retired), passed away suddenly at his residence at Ealing, on Saturday last, heart failure being the cause. Captain Sankey was born at Nenagh, Ireland, in November, 1853, and was therefore in his 72nd year. He was a past president of the Institution of Mechanical Engineers, a member of the Institution of Civil Engineers, of the Institution of Electrical Engineers, and of the Institute of Naval Architects. He obtained his commission in the Royal Engineers in 1873 and after sixteen years in fortification and other branches of military engineering, telegraphs, signalling and other service, he retired in 1889 to become a director of Willans & Robinson (in recent years amalgamated in the English Electric Co., Ltd.). When Mr. Willans passed away Captain Sankey undertook the editing of his works on steam engine trials. He devoted a great deal of time to steam turbine and internal combustion engine design. He left Messrs. Willans & Robinson, Ltd., Rugby, in 1904, in order to take up consulting engineering work. He was very closely engaged with Marconi's Wireless Telegraph Co., Ltd., as director and consulting engineer, and he was also a director of Marconi's International Marine Communication Co., Ltd., and other Marconi concerns. He held many other directorships as well, among the companies with which he was thus connected being the Relay Automatic Telephone Co., Ltd., the Never-Stop Transit, Ltd., the Niclausse Water Tube Boiler Co., the Still Engine Co., Ltd., &c. He was a member of various engineering committees, was the

Elliott & Fry] [*London.*

The Late Captain M. H. P. Riall Sankey.

author of various papers, &c., and a frequent speaker in public discussions. The funeral took place on Wednesday, October 7th, at Brompton Cemetery.

Mr. A. R. Dodge.—The death occurred in August of Mr. Austin R. Dodge, consulting engineer to the American General Electric Company. Mr. Dodge had been connected with the company for nearly 30 years, having dealt principally with turbine matters.

Mr. J. P. Lawlor, county councillor for Wicklow, who died last week at Dundrum, in that county, was a pioneer of electric lighting in the county.

New Companies Registered.

W. R. Thornton, Ltd. (208,677).—Private company. Registered September 28th. Capital, £1,000 in £1 shares. Objects: To acquire the business of an engineers' furnisher, electrical engineer and contractor and dealer in mechanical and electrical apparatus and appliances carried on by the liquidator of W. R. Thornton & Son, Ltd., of Barrow-in-Furness. The first directors are:—W. R. Thornton, Ruskinville, Dalton-in-Furness, electrical engineer (permanent governing and managing director); and A. A. Haynes, Dane Garth, Barrow-in-Furness, railway officer. Qualification of W. R. Thornton, 50 shares; of other directors, £1. Solicitor: P. K. Lee, 4, Lawson Street, Barrow-in-Furness. Registered office: 123, Ramsden Square, Barrow-in-Furness.

Kingsway Radio, Ltd. (208,759).—Private company. Registered October 2nd. Capital, £3,000 in £1 shares. Objects: To acquire the business now carried on at Cannon Street, E.C., as the "Kingsway Radio Co.," and to carry on the business of manufacturers of and dealers in wireless instruments and accessories of all kinds, photographic instruments and accessories and sports requisites of all kinds, &c. The subscribers (each with one share) are:—P. F. Hedges, The Briars, Southend Road, Hockley, Essex, managing clerk; C. W. Church, 1, Bush Lane, E.C.4, clerk. The first directors are:—H. L. Percy, W. J. Mather and C. M. Sutherland, addresses not stated. The said H. L. Percy shall be a director so long as he lives, and the said W. J. Mather shall be entitled to hold office so long as he lives and is holder of 500 shares. Qualification (except permanent directors), 250 ordinary shares. Remuneration, £150 each per annum. Solicitors: Peter Thomas and Clark, 1, Bush Lane, Cannon Street, E.C.4.

Société Genevoise, Ltd. (208,746).—Private company. Registered October 1st. Capital, £1,000 in £1 shares. Objects: To carry on the business of manufacturers of, agents for and dealers in scientific instruments, appliances and apparatus of all kinds, electrical, magnetic, steam, hydraulic and other engines, machines, appliances and apparatus, telegraphic and telephonic appliances and apparatus, mechanical, electrical, motor and general engineers, electricians, &c. The subscribers (each with one share) are:—W. L. Custance, 41, Albert Road, W.22, merchant; H. R. White, 39, Wellington Avenue, N.15, chartered secretary. The first directors are:—F. Turrettini (permanent) and W. L. Custance. Solicitors: Bate & Co., 35, Bedford Row, W.C.1. Registered office: 95, Queen Victoria Street, E.C.4.

Winchcomb Electric Light and Power Co., Ltd. (208,731).—Private company. Registered October 1st. Capital, £6,000 in £1 shares. Objects: To carry on the business of an electric light and power supply company. The permanent directors are:—J. Atkins, 53, Church Street, Tewkesbury, electrical engineer; R. W. W. Edwards, Cleve Hill, near Cheltenham, hotel proprietor; W. C. Hands, 195, North End Road, West Kensington, W.14, electrical engineer; W. E. C. Hutchings, North Farncote, Winchcomb, farmer; and H. W. Stephens, Winchcomb, solicitor. Qualification, £50. Secretary and solicitor: H. W. Stephens, Winchcomb, Glos.

Quickfix Electrical Fittings Co., Ltd. (13,822).—Private company. Registered in Edinburgh September 28th. Capital, £10,000 in £1 shares. Objects: To carry on the business of manufacturers of and dealers in all apparatus, fittings, fixtures and accessories in connection with electric and gas lighting and power, &c. The directors are:—J. Coggans, 154, George Street, Glasgow, manufacturer; H. Patrick, 15, Mair Street, Plantation, Glasgow, wine and spirit merchant; G. U. Scott, 95, Renfield Street, Glasgow, picture house director; and J. McLean, 12, Woodside Terrace, Glasgow, commission agent. Qualification, 200 shares. Registered office: 33, Bath Street, Glasgow.

Neron Lamps, Ltd. (208,763).—Private company. Registered October 2nd. Capital, £5,000 in £1 shares. Objects: To carry on the business of engineers, electrical engineers, electricians, suppliers of electricity, manufacturers and vendors of electric lamps, &c. The subscribers (each with one share) are:—L. F. Szilagyi, 16, Helenslea Avenue, N.W.11; J. A. Milne, 82, Hazelwood Lane, Palmer's Green, N.13, chartered secretary. The directors are:—R. T. Durran, address not stated; C. P. Jenson, address not stated; L. F. Szilagyi, 16, Helenslea Avenue, N.W.11 (director of Siemens-Schuckert (Great Britain), Ltd.). No share qualification required. Solicitors: Nicholson, Graham and Jones, 19-21, Moorgate, E.C.

Impex Electrical, Ltd. (208,707).—Private company. Registered September 30th. Capital, £2,000 in £1 shares. Objects: To carry on, in the U.K. or elsewhere, the business of importers, exporters, manufacturers, salesmen, factors, brokers and suppliers of, agents for and dealers in wireless and electrical instruments, apparatus, accessories, machines and materials of all kinds capable of being used in connection with electricity, radio or wireless telegraphy, telephony or telephotography, &c. The subscribers (each with one share) are:—M. Franses, 5, Granville Mansions, Shepherds Bush, W.12, merchant; S. Franses, 28, Queen's Road, Bayswater, W.2, merchant. The first directors are not named. Solicitor: H. A. Lawrance, 13, Hanover Street, W.1.

Official Returns of Electrical Companies.

Brookhirst Switchgear, Ltd. (175,995).—Return dated December 31st, 1924 (filed April 20th, 1925). Capital, £550,000 in £1 shares. 126,002 shares taken up. £30,502 paid. £95,500 considered as paid. Mortgages and charges, £25,000.

Tisbury Electric Supply Co., Ltd. (176,539).—Return dated May 21st, 1925. Capital, £6,000 in £1 shares. 5,000 shares taken up. £5,000 paid. Mortgages and charges, nil.

Gayton Park Electricity Co., Ltd. (184,208).—Return dated April 6th, 1925. Capital, £3,000 in £1 shares. All shares taken up. £3,000 considered as paid. Mortgages and charges, nil.

J. Hadden & Co., Ltd.—J. E. Percival, of 6, Old Jewry, E.C.2, ceased to act as receiver or manager on September 17th, 1925.

C. J. Thursfield & Co., Ltd.—Second mortgage debenture dated September 16th, 1925, to secure £500 charged on the company's undertaking and property, present and future, including uncalled and unpaid capital. Holder: R. S. C. Jamie, 106, Trafalgar Road, Moseley, Birmingham.

Yeovil Electric Light and Power Co., Ltd. (186,456).—Return dated May 25th, 1925. Capital, £10,000 in £1 shares. All shares taken up. £10,000 paid. Mortgages and charges, nil.

Barrett & Morris, Ltd.—Satisfaction in full on May 24th, 1925, of debenture dated July 25th, 1924, securing £100. (Notice filed September 23rd.)

Newton Brothers (Derby), Ltd. — Particulars filed of £30,000 debentures authorised September 10th, 1925, charged on the company's undertaking and property, present and future, including uncalled capital, the whole amount being now issued.

Bordesley Electrical Accessories Co., Ltd. (176,962).—Return dated November 21st, 1924 (filed April 24th, 1925). Capital, £5,000 in £1 shares. 4,662 shares taken up. £2,350 paid. £2,312 considered as paid. Mortgages and charges, £500.

Resisto Electric Wire and Tape Co., Ltd. (176,804).—Return dated January 13th (filed March 21st), 1925. Capital, £500 in £1 shares. All shares taken up. £500 paid. Mortgages and charges, nil.

City Notes.

Reports and Meetings of Electrical Companies; Dividend Results, &c.

Agricultural and General Engineers, Ltd.

The report for the year ended March 31st last states that the depression in the home and foreign markets continued to have an adverse effect upon the affairs of the constituent companies, but an improvement was shown and this is continuing. The combined accounts show a manufacturing profit of £406,963, as against £362,806, and the profit carried down rose from £78,697 to £111,624. The gross profit of the parent company was £44,100, and after deducting expenses a balance of £379 remains, as compared with £6,884 in the previous year. The addition of the amount brought forward leaves £10,861 to the credit of the revenue account. The meeting is to be held on October 16th.

Western Electric Distributing Corporation, Ltd.

The report for the year ended June 30th shows a net profit of £7,938; to this is added £915 brought forward, making £8,853. It is proposed to pay a final dividend of 5 per cent., making 8 per cent. for the year (as compared with 10 per cent. in 1923-24), to transfer £1,750 to reserve, and to carry forward £751. The issue of 20,000 ordinary and 20,000 six per cent. cumulative preference shares of £1 each has been sanctioned. The ordinary shares are being offered at par and the preference shares at a premium of 5s. 6d. to existing shareholders.

Falkirk Iron Co., Ltd.

The directors propose to issue a new series of 6 per cent. debentures to replace the existing 8 per cent. first mortgage debentures now outstanding. It has been decided to limit the issue to £130,000. The new debentures will mature in 1945, when they will be repaid at par unless they have previously been redeemed by the operation of the sinking fund. Commencing in 1935, an annual drawing will be made, or they will be purchased in the market, to the total of £6,000 per annum. The holders of the existing 8 per cent. debentures will have the option of converting their holdings into ordinary shares at the price of 25s. per share, or into the new debentures.

Swiss Companies.

The accounts of the Bank für Elektrische Unternehmungen, of Zurich, for 1924-25, including the amount of 256,000 fr. brought forward, show an available surplus of 5,033,000 fr., as compared with 4,174,000 fr. in the previous year. It is proposed to pay a dividend at the rate of 8 per cent. on the A and B shares of the corresponding nominal amount of 500 fr. and 50 fr., and to place 500,000 fr. to the special reserve fund.

The directors of the Maschinenfabriken Escher, Wyss and Company, of Zurich, report net profits of 635,000 fr. for 1924-25, as compared with 493,000 fr. in the previous year, and propose to pay the statutory dividend of 8 per cent. on the preference shares, while no distribution is to be made on the ordinary shares, which received 4 per cent. in 1923-24. The passing of the dividend on the latter is due to the desire to strengthen the working funds owing to the existing keen competition. During the past year it was only possible to obtain normal activity at very depressed prices, and the results were also prejudiced by a strike extending over two months.

French Companies.

The directors of the Electro-Métallurgie de Dives report net profits of 9,055,000 fr. for 1924-25, as compared with 5,535,000 fr. in the previous year. It is proposed to increase the rate of distribution from 70 fr. per share in 1923-24 to 80 fr. for the past year.

The Société des Accumulateurs Electriques (formerly A. Dinin) reports a large increase in the gross profits for the year 1924-25, the net profits and balance forward amounting to 3,782,000 fr., as compared with 1,891,000 fr. in the previous year. It is proposed to pay a dividend at the rate of 18 fr. gross per share, as against 12 fr. in 1923-24.

La Société des Accumulateurs Dinin, of Paris, reports a profit of 13,421,052 fr. for the financial year 1924-25, as compared with only 12,526,315 fr. for the preceding 12 months.

German Companies.

The Electricity Company (late W. Lahmeyer) reports net profits of 1,593,000 marks for 1924-25 and a dividend at the rate of 8 per cent. on the ordinary shares.

The Poege Electricity Company, of Chemnitz, has decided to carry forward the loss of 36,000 marks incurred in 1924-25 owing to unfavourable sale prices and high taxes and social burdens.

Kaministiquia Power Co.—At a meeting on October 1st the shareholders ratified the scheme for the sale of the company's assets to the Fort William Paper Co. mentioned in our issue of September 25th (p. 509).

Polish Companies.—The Société d'Entreprises Electriques en Pologne, of Brussels, is increasing its capital from 10 to 20 million francs.

Company to be Struck off the Register.—The name of the undermentioned company will be struck off the register at the expiration of three months unless cause is shown to the contrary :—

Witchell's Electrical Accessories, Ltd.

Browett, Lindley & Co., Ltd.—It is not proposed to pay any interim dividend on either the preference or ordinary shares.

Stocks and Shares.

Monday Evening.

Four p.c. is a very useful Bank Rate for trade and finance alike. Its establishment last Thursday proved to be another pleasant surprise to the Stock Exchange. Although a reduction had been previously anticipated, its announcement was not expected when it actually came, for money market conditions hardly warranted the alteration, so far as the layman could discern. In explanation, the theory is advanced that the Bank Rate has come down on political reasons; in other words, that the Treasury is anxious to do everything possible in order to stimulate national trade and industry.

The immediate effect was to lead to a strengthening of prices in the gilt-edged section. Investment issues of all kinds went better. A premium of 2s. was bid for the new County of London preferences. Debenture stocks have become harder to find than ever. There happens to be on offer at the moment a modest amount of General Electric 7 p.c. debenture at 104¼. The price would stand higher were it not for the fact that the company has the right to redeem the stock at 100 in 1931, if it cares to exercise this option. Moreover, there is a sinking fund, now in operation, for repayment of a certain amount of stock every year at par.

The only noticeable change in the prices of London electricity supply shares is ¼ rise in St. James and Pall Mall ordinary, to 14¼. Charing Cross preference are rather better. In the provincial list of ordinary shares, Bournemouths have receded to 58s. 9d. Bromley (Kent) are 34s. 6d., Folkestone 39s. 6d., Oxford 5¼, Isle of Thanet 17s., and Llanelly 19s. 9d. Of the Colonials, Victoria Falls ordinary keep good at 48s. 3d., the preference being 32s. Amongst the foreign stocks, Mexicans tend to droop. Reversion to Greenwich mean time had no influence over illumination shares. Gas stock went a little easier.

Home Railway issues have been rising and falling with the capriciousness of a barometer. At the Liverpool Labour Congress, the Communists received such snubs that the Home Railway market plucked up heart, and substantial rises were secured. Then came the week-end hints of N.U.R. trouble, and some of the previous gains became lost. Metropolitans show on balance a rise of 4 points at 68½, and Districts are 3 up at 44½. Underground Electric Railways £10 shares have strengthened to 2¼ and the Income bonds at 97 stand 2 points higher at 97. The market lacks the power to attract the public, however, and prospective purchasers are startled by any shadow of Labour disturbances.

Considerable business is being done in the new shares of the United River Plate Telephone, the price of which is 35s. premium. The old shares, at 7, are ex rights. Chili Telephones have risen to 5¾. Cable stocks are dormant; there is little interest being taken in them at present. Great Northerns show a 5s. rise. Wireless shares have the public interest in Canadian Marconi as the feature of their market. The price touched 7s. before reacting to 6s. 9d. Radio common and preferred are both very quiescent.

Brazilian Tractions dipped to 72¼, and rallied to 74 bid. Anglo-Argentine Tramways 5 per cent. debenture is in request at 76. Rio Tramways firsts rose to 96½, the seconds to 86¼. Of dollar stocks, Shawinigan Water Common improved to 167¼. British Electric Traction ordinary is better at 121.

Siemens are a hard market at 28s. 9d. The price drooped to 27s. 6d., but was quickly restored to its previous level. Metropolitan-Vickers are a florin down. Electric Constructions shed 1s. 6d. Edisons have gone back to 8s. Cable Construction issues are dull. The reason given in the market is that holders have been selling these in order to meet their obligations in the rubber share market. This is a factor which does duty in every Stock Exchange department that exhibits dullness nowadays. The roar of the rubber boom is heard in the land; the world and his wife are bent—especially the wife—upon making easy fortunes out of rubber shares. To finance the purchases, stocks and shares of other kinds have been sold. The dullness of engineering and similar issues has a more direct cause in the postponement by Armstrongs of the interim dividend payments upon the company's junior preference shares. Babcocks are 50s., and are unchanged on the week.

Share List of Electrical Companies.

Home Electricity Companies.

	Nom. £	Dividend. 1923.	Dividend. 1924.	Price Oct. 5. 1925.	Rise or fall.	Yield p.c.
Bournemouth and Poole	1	12	14	27/6	—	1/2 4 15 4
Brompton Ordinary	1	10	10	12	—	*5 14 3
Charing Cross Ordinary	1	14½	15	£0/-	—	6 2 5
do. do. 4½ Pref.	1	4½	4½	17/6	+3d.	5 2 10
Chelsea	1	12	12	1½	—	6 8 0
City of London	1	15	15	48/3	—	6 4 4
do. do. 6% Pref.	1	6	6	23/-	—	5 4 4
Clyde Valley	1	8	8	28/6	—	5 12 4
County of London	1	15	15	57/-	—	5 5 3
do. do. 6% Pref.	1	6	6	23/-	—	5 4 4
Edmundson's Ordinary	1	7	7	22/-	—	6 7 3
do. 7% Pref.	1	6	7	21/6	—	6 10 3
Elec. Supply Corporation	1	10	10	31/3	—	6 8 0
Kensington Ordinary	5	14	15	12½	—	5 16 8
Lancs. Light and Power	1	7½	7½	26/-	—	5 15 5
London Electric	1	10	10	34/-	—	5 17 8
do. do. 6% Pref.	5	6	6	5½	—	5 7 10
Metropolitan	1	10	11	39/3	—	5 11 4
do. 4½% Pref.	1	4½	4½	17/-	—	5 5 11
Midland Counties	1	5½	6	22/9	—	5 5 6
Newcastle-on-Tyne Ordinary	1	6	7	1½	—	6 4 5
do. 5% Pref.	1	5	5	18/3	—	5 6 8
do. 7% Pref.	1	7	7	24/6	—	5 14 3
Notting Hill 6% Pref.	10	6	6	9½	—	6 6 4
North Met. Elec. 6% Pref.	1	6	6	22/-	—	5 9 1
St. James' and Pall Mall	5	17½	17½	14¼	+ ¼	5 17 8
South London	1	15	15	2½	—	6 0
South Metropolitan Pref.	1	7	7	1½	—	5 12 0
Urban Ordinary	1	4	4	18/3	—	4 7 8
do. 6% Pref.	1	6	6	19/6	—	6 3 1
Westminster Ordinary	1	15	15	44/-	—	6 16 4
Whitehall Elec. Invst. 7½% Pref.	1	7½	7½	1	—	7 10 0
Yorkshire Elec.	1	8	8	29/6	—	5 8 6

Home Rails.

Central London Ord. Assented	Stock	4	4	66	—	6 1 3
Metropolitan	"	4	5	68½	+4	7 6 0
do. District	"	3½	3½	44½	+3	8 10 9
Underground Electric Ordinary	10	Nil	Nil	2¼	+ ¼	Nil
do. do. "A"	1/-	Nil	Nil	6/6	—	Nil
do. do. Income Bonds	6	6	6	97	+2	*6 3 9

Telegraphs and Telephones.

Anglo-Am. Tel. Pref.	Stock	6	6	109½	—	5 17 1
do. Def.	"	1½	1½	23¾	—	6 6 4
Automatic Telephone	1	3	6	47/6	—	2 10 7
Chili Telephone	5	6	5	5¾	—	½ *4 7 0
Cuba Sub. Ord.	10	5	5	6¼	—	8 0 0
Eastern Extension	10	10	10	17½	—	*5 15 11
Eastern Tel. Ord.	Stock	10	10	17½	—	*5 16 7
Globe Tel. and T. Ord.	10	10	10	17½xd	—	*5 13 4
do. do. Pref.	10	6	6	10¾	—	5 10 4
Great Northern Tel.	10	22	22	33	+ ½	6 13 4
Indo-European	25	7	8½	42½	—	*5 2 5
Marconi	1	10	10	1 7/16	—	6 19 2
Marconi Marine	1	10	7½	¾	—	8 11 6
Oriental Telephone Ord.	1	12	12	2 1/16	—	*5 16 4
United R. Plate Tel.	5	8	8	7	— ½	5 14 4
Western Telegraph	10	10	10	16½	—	*6 4 0

Home and Foreign Trams, &c.

Anglo-Arg. Trams First Pref.	5	5½	5½	8¾	—	8 3 0
do. do. 2nd Pref.	5	6	6	9¾	—	8 17 10
do. do. 5% Deb.	Stock	5	5	7½	—	6 10 9
British Electric Traction Ord.	"	6	6	121	+1	4 19 2
do. do. 6% Pref.	"	6	6	107	—	5 12 2
Brazil Traction	100	4	4	74	—	5 8 1
Brit. Columbia Elec. Rly. Pcs.	Stock	5	5	88½	+1	5 13 0
do. do. Preferred	"	96/-	96/-	91½	+2	*5 1 1
do. do. Deferred	"	120/5	122/5	111½	+2	*5 15 7
do. do. Deb.	"	4½	4½	77½	+1	5 9 8
Lond. & Sub. Trac. 5% Pref.	1	2½	Nil	4/6	—	Nil
London United Tram. Deb.	Stock	4	4	43½	—	9 8 4
Mexico Trams, 5% Bonds	—	5	5	63½	—	7 17 6
Mexican Light Common	100	Nil	Nil	33	—	Nil
do. Pref.	100	Nil	Nil	83	–1	Nil
do. 1st Bonds	—	5	5	73½	–1	6 18 0
Yorkshire (West Riding)	1	5	—	18/9	—	5 6 8

Manufacturing Companies.

Babcock & Wilcox	1	12	12	2½	—	*4 16 0
British Aluminium Ord.	1	5	10	33/9	–9d.	5 19 5
British Elec. Transformer Pref.	1	Nil	7	1	—	... ...
British Insulated Ord.	1	15	15	3 1/16xd	—	4 12 4
Brush Ord.	1	10	10	23/-	+£d.	8 13 10
Callenders	1	15	15	3 1/16	—	1/16 4 14 1
do. 6½% Pref.	1	6½	6½	23/9	—	5 9 5
Crompton Ord.	1	Nil	Nil	¾	—	... ...
Edison-Swan	4/-	10	10	8/-	–9d.	5 0 0
do. 5% Deb.	Stock	5	5	80½	—	6 4 3
Electric Construction	1	10	10	30/6	–1/6	6 11 2
Enfield Cable, Pref.	1	7½	7½	1½	—	6 0 0
English Electric	1	5	5	17/3	–1/-	5 15 3
do. do. Pref.	1	6	6	20/-xd	—	5 17 1
Gen. Elec. Pref.	1	6½	6½	26/9	—	5 9 5
do. Ord.	1	5	7½	27/-	—	5 11 1
Henley	1	15	16	3 1/16	—	1/16 5 0 5
do. 4½% Pref.	5	4½	4½	4½	—	5 6 0
India-Rubber	1	5	5	1 1/16	—	*4 14 1
Johnson & Phillips	1	10	10	48/9	—	4 2 0
Met-Vickers, Ord.	1	8	8	22/4	–2/-	7 2 3
do. Pref.	2	8	8	2¾	—	6 14 9
Siemens Ord.	1	—	7½	28/9	—	5 4 4
Telegraph Construction	12	20	20	26½	—	4 10 0

* Dividends paid free of Income Tax.

The Berlin Wireless Exhibition.

Some Impressions of a Visitor.

THERE were certain aspects of the large Exhibition held in the Berlin Radio Hall this year which reminded us that the more energetic type of British wireless manufacturer is by no means confined to his home market, but that on occasion he can carry the war into the enemy's country with effect. The English visitor on arriving at the exhibition would particularly notice that one shop window almost next to the Hall was crowded with a comprehensive range of Amplion loud speakers. In the hall itself, he would observe that one

Fig. 1.—A German Set incorporating a Brown Loud Speaker.

German maker exhibiting a range of high-class cabinet receivers of the 8-valve type had adopted the Brown loud speaker as being the best obtainable for the work (fig. 1); this was the Radiotechnische Werke, and the familiar name on the loud speaker was one of the first things which attracted attention to the sets. In the hall, too, was to be noticed a very comprehensive exhibit of Clix (fig. 2), all the three makes in question being widely known in Germany.

The Radio Hall, in which the Exhibition was held, a huge structure with a floor area of some 80,000 square feet, was hardly large enough for the exhibits and the large attendance. During the course of the exhibition last December, some 200,000 people visited the hall, and the public interest in wireless shows no sign of abating this year. At any rate, the crowds in the building were the reverse of pleasant after half-past eleven each day, and it involved a struggle to examine the exhibits after that hour. Apart from the crowd, however, the reception arrangements for foreign visitors were unusually thorough. The amusement side of the Exhibition had also received great attention. Loud-speaker installations throughout the hall distributed music during the day, and a small theatre seating some 500 people was arranged in a minor hall of the building, where a typical broadcast farce (complete with chorus) was given several times daily to crowded houses. The exhibition building, too, with its open-air restaurant and its situation near the beautiful Grunewald, could hardly have been better adapted to its purpose.

The Deutsche Reichspost (German Post Office) had an interesting exhibit on the gallery of all the apparatus of a typical transmitting station, including a small studio, as well as a number of typical receiving instruments from a 7-valve down to a 2-valve, these sets being shown unboxed, while large and well-executed drawings of the circuits were mounted on the wall behind each instrument to enable the visitor to follow its construction, as seen in fig. 4. The connection between the German Post Office and the wireless industry is, of course, much closer than in this country, for in addition to suppiying the equipment of the transmitting stations, it is also a large shareholder in each of the broadcasting companies, and exercises a very great measure of control quite apart from its power in the way of regulations.

The competition of German-made telephones has always been an extremely marked feature of the English trade ever since the early days in 1923, when makers were startled to find their home market flooded with German headsets, all duly stamped B.B.C., in spite of the so-called prohibition of the use of imported sets. Since then so many thousands of them have been unloaded in this country at cut prices that English makers have of late been considering an application for this essential branch of the wireless trade to be protected by the Safeguarding of Industries Act. It is evident from an inspection of the Berlin Exhibition that this competition is still keen, and it was quite easy to obtain telephones in fairly small lots at prices in the neighbourhood of 5s., which confirms (if any confirmation were needed) the complaint recently made by Mr. Hooker, a director of Messrs. C. A. Vandervell, Ltd., that many German-made telephones are supplied below the English cost of production. Many makers represented at the Berlin Exhibition claim to be exporting their headsets in thousands to England without any trade mark. Though German production costs show an upward movement, the telephone makers are doing everything in their power to retain their hold on the trade by cheapening the construction, but this policy seems now to have been carried to excess, and it is hardly probable that any worse competition in telephones will be experienced than hitherto.

The average amateur, on the other hand, has for many of his requirements to pay a higher price than in England. It is, for instance, seldom that a piece of crystal can be obtained for less tnan 1s. 6d., while the detector portion arranged to plug in to the set in very

Fig. 2.—A familiar English Accessory.

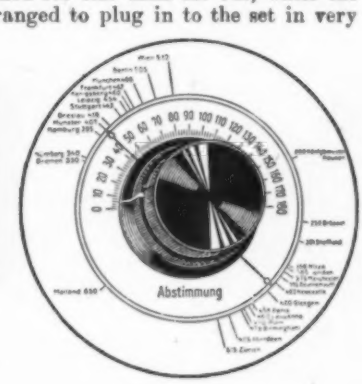


Fig. 3.—A German Dial.

much the same way as a valve costs 6s. or 7s. Further, his various accessories in the way of aerial, batteries, accumulators, &c., are usually higher in price than the amateur is accustomed to pay in this country.

In sets, there is a steadily increasing improvement over previous years, and most of the valve instruments on exhibition were quite up to date in the employment of reaction, which had previously been forbidden by the regulations. One of the most noticeable features of the sets was the way in which the use of ebonite was avoided, and in fact everything possible was done to cut down the cost of construction of most of the instruments shown. Examples of sets in elaborate "period" furniture were rare compared with what is usual at an exhibition in this country. In spite of this, however, the sets on view presented, on the

whole, a very attractive and uniform appearance, with their dead-black and plated finish. One of the small features which mark the average German instrument is the increasing adoption by many makers of very elaborately engraved 5-in. diameter fixed dials, these

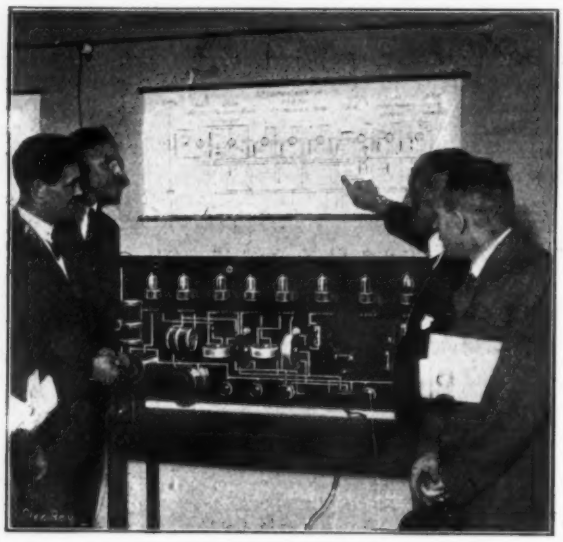


Fig. 4.—Part of the German Post Office exhibit.

being sometimes merely calibrated in degrees on the upper half, leaving space on the lower half for the user to mark his own readings; other makers have the dial engraved with both the wave lengths and the name of every station which the apparatus will receive at the exact spot where the pointer should be set. One is tempted to wonder, however, what sort of corrections will be required when the instrument is eventually installed some two or three hundred miles from the place where these settings were originally obtained, and when, in addition, the user has exercised the usual privilege of varying the length and direction of his aerial and making the other little changes which are customary.

The home construction of sets has in the past been practically forbidden by the regulations, or, at any rate, only allowed in the case of members of one or other of the recognised amateur clubs, but it will now rapidly come into favour with the abolition of the old restrictions from September 1st. On the stand of one of the principal makers of parts they had the happy idea of installing a boy of 14 at a bench in the front of the stand, who was continuously occupied in building up instruments from the various components exhibited, and showing how rapidly these could be made up. The removal of the restrictions, too, has brought forward a big variety of publications for the amateur, and on one stand in the gallery a publisher was exhibiting dozens of different cheap handbooks priced at 1s. and 1s. 9d. each, together with a specimen of each instrument described, which had been built by different members of amateur clubs. The clubs, such as that organised by the "Sendung," and the Deutscher Funk Technische Verein, also had stands, on which were shown models of the sets built by their members, complete with well-executed drawings.

It is estimated that the total attendance at the exhibition during the time it was open from September 4th to the 13th was about double last year's figure.

New Electric Fires.

Designs for the Coming Season.

(*Continued from page 534.*)

Belling & Co.

A rather novel form of imitation coal fire (fig. 14) is included among several new designs which this firm has put on the market. A wrought-iron brazier measuring 24 in. high, 16¼ in. wide, and 8¼ in. deep is packed with imitation coal illuminated by a concealed amber lamp. Fitted in the front of the brazier are two 1-kW fire bars with separate switches. The bars are of the firm's standard "Multi-Parabola" type; this form of bar has 75 small parabolic wells which, it is claimed, throw the maximum amount of heat forward. The bar is curved to

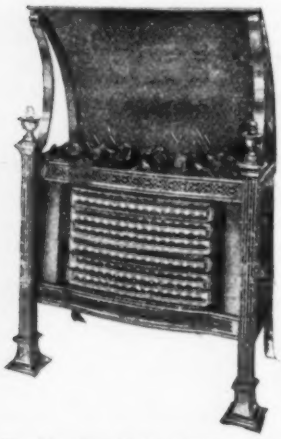


Fig. 14.—The Belling "Pillar" Fire.

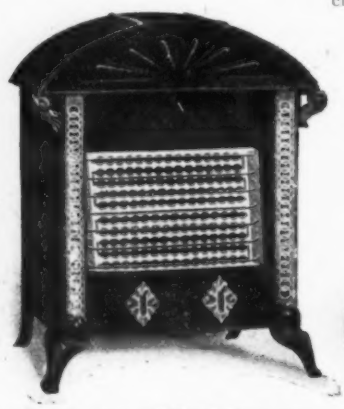


Fig. 15.—The "Belling" Dome Fire.

give a wider distribution. The fire is mounted on four legs, the front pair taking the form of square columns. Four finishes are available.

Another new "Belling" fire is that shown in fig. 15. This is a low-priced model made of sheet steel, the ornaments being of solid cast brass finished in bronze. The top is domed and perforated, and is so arranged that kettles, &c., can be placed upon it. The fire is fitted with two separately-switched "Multi-Parabola" 1-kW elements, and is given a black and bronze finish.

Bastian & Allen.

The fires manufactured by this firm are distinguished by the well-known "Quartzalite" element, in which the wire is wound in or upon quartz tubes, raising the latter to a solid red glow. Among the season's designs is the "Salisbury" type shown in fig. 16. This has an attractive appearance, being finished in oxidised copper. Behind the elements is a polished copper reflector which can be readily removed for cleaning. The dimensions are:—Height 15 in., width 17 in., and depth 9 in. The loading can be anything between 1 and 2 kW.

Fig. 16.—The "Salisbury" Fire.

Fig. 17.—The "Quartzalite Adam Fire.

Another "Quartzalite" fire is the "Adam" pattern (fig. 17). This also can be arranged for from 1 to 2 kW. The finish is oxidised silver, and the fire is 15 in. wide and 18 in. high.

H. W. Sullivan, Ltd.

One of the new fires produced by this company is the "utility" design, illustrated in fig. 18. This, the "Adapta" fire, is equipped with a movable 750-W element which, by means of a small lever, can be turned from a vertically-sloping position into the horizontal position in which it is seen in the illustration. Thus the fire can be used for ordinary heating purposes or for boiling a kettle. The model is finished in black enamel with nickel-plated relief. Its height is 12¼ in., width 11¼ in., and depth 6¼ in. Another new Sullivan design is the "Adjusta" fire (fig. 19). This, it will be observed, is so mounted that it can be swung and fixed in any position. Two "Uniglow" elements, each of 1,000-W loading, are fitted, and the case is of cast-iron and sheet-steel finished in black enamel with aluminium reflectors and nickel-plated mounts. The dimensions are:—Height 20½ in., width 15 in., and depth 9½ in.

Metro-Vick Supplies, Ltd.

Included in the new designs put forward by this company is a new model of "Cosmos" bowl fire (fig. 20). This is similar to the original pattern in general arrangement; the reflector is of hammered copper, 12 in. in diameter. Fig. 21 shows a new cast-iron model of the "Cosmos" radiant fire which has been produced to meet the demand for a light fire for municipal hiring schemes. A new type of element (2-kW) is fitted; the backplate hinges down, and the elements can be replaced in a few minutes. The fire has an oxidised copper finish. A third design is the Jacobean "Cosmos" fire, illustrated in fig. 22. The heating element consists of two 1-kW bars, each composed of a cylinder of special refractory material on which the resistance wire is tightly wound. The whole element bar attains the same degree of red heat as the resistance wire.

Fig. 18.—The Sullivan "Adapta" Fire.

Fig. 20.—New "Cosmos" Bowl Fire.

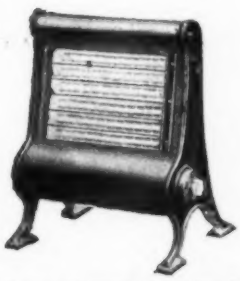


Fig. 21.—A "Cosmos" Cast-iron Fire.

Fig. 19.—The Sullivan "Adjusta" Fire.

Fig. 22.—A Jacobean "Cosmos" Radiant Fire.

Each bar can be replaced quickly by unscrewing a wing nut at each end.

Siemens and English Electric Lamp Co., Ltd.

This company handles the "Xcel" domestic appliances made by the Automatic Telephone Manufacturing Co., Ltd. In a recently-issued booklet a number of new designs of "Xcel" fires are illustrated; we have selected two of them for mention. One (shown in fig. 24) is a "well"-type fire, in which the elements are mounted horizontally in a recessed base; a curved polished-copper reflector throws the heat forward, while there is also a certain amount of direct heat projected through openings in the base. There are four 600-W elements, and these are plugged into special sockets at the sides and are easily replaced. The fire has an art-black finish and measures 19½ in. by 21 in. by 10½ in.

The other (fig. 23) is a bowl-type heater—the "Fulray." It has a plug-in element similar to those used in the first-mentioned fire with a loading of 600 or 1,000 W. A carrying handle is provided, and the bowl can be tilted and fixed in a horizontal position. The base can be either black or bronzed.

Jackson Electric Stove Co., Ltd.

Among the new season's models made by this company is the "No. 589" design depicted in fig. 25. This is a development of the "Cheery" fire, and, like that model, has a polished back reflector, broken up into horizontal sections, with the element (1.5, 2, or 3 kW) arranged at the base. The depth

Fig. 23.—The "Fulray" Bowl Heater.

Fig. 24.—An "Xcel" Well Fire.

Fig. 25.—The Jackson "No. 589" Fire.

is sufficient to permit a 2-pint kettle to be placed over the element on a swing-over trivet. A number of finishes are provided.

Berry's Electric, Ltd.

This company has put forward two new designs of "Magicoal" fires, of which Mr. Berry was the originator. One of these is a Queen Anne model. This fire has a 3-kW loading with a controlling switch. The dimensions are: Height 26 in., width 34 in., depth 20 in., and the body has a plated steel finish.

The company has also placed on the market the "Mulparvo" utility heater (fig. 26), which can be used either as a fire,

placed on end or horizontally, or as a small cooker. The element is loaded at from 600 to 1,000 W, and it is easily removed

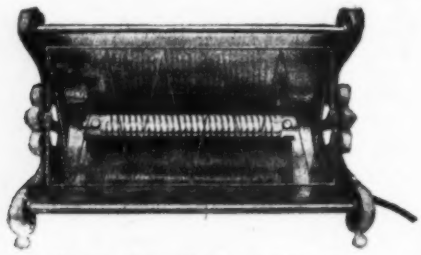


Fig. 26.—The "Mulparvo" Utility Heater.

for replacement. Oxidised copper and silver finishes are available.

(To be continued.)

Church-Bell Ringing by Electricity.

The Autosonneur.

The following is a brief description of an interesting method of ringing church bells by electricity, which has recently been patented by Mr. F. Wust and put on the market by the French firm of Messrs. Wyss & Cie., who are represented in this country by Mr. Paul Diény. The installation comprises a small electric motor, fig. 1, working in conjunction with a special device by means of which the rotary motive power of the motor is only imparted to the bell on its upward stroke. The motor drives the apparatus by means of a belt, provided with a jockey pulley, working on a flywheel loosely mounted so that it normally runs free on a main shaft. On one end of the latter is a sprocket on which works a length of pitch chain, the ends

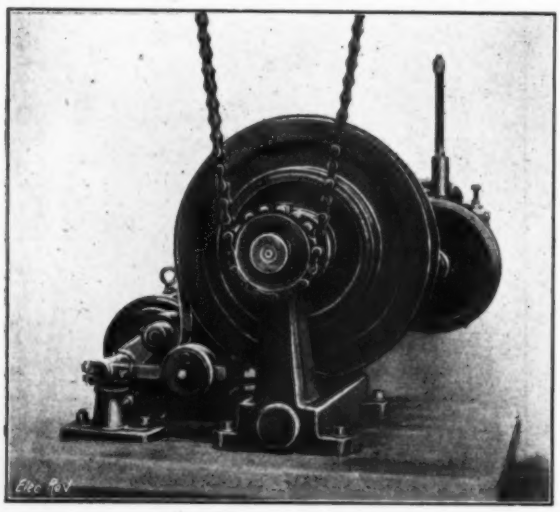


Fig. 1.—Bell Ringing Device.

of which are connected to a light steel band running in a grooved pulley secured to the bell arbour. At the opposite end of the shaft is a pinion and spur wheel, connected with an automatic gear, by means of which a clutch is automatically disengaged on the completion of the upward stroke of the bell. The female portion of the clutch is built up as part of the flywheel, while the male part is secured to the shaft on which the sprocket is mounted. On the completion of the upward stroke, the bell in its descent reverses the motion of the steel band and chain; this by the medium of suitable mechanism brings into action a brake band on a drum, connected with which is a system of levers by means of which the clutch is disengaged. As soon as the bell reaches its lowest position and has again to be lifted, the brake band is released, allowing the clutch to be once more engaged, and the power of the motor to be imparted to the sprocket. Thus while the flywheel runs continuously in the one direction the shaft carrying the sprocket reverses at each oscillation of the bell, disengaging the clutch on the downward stroke, and engaging it on the upward one. Cam adjustments are provided whereby the degree of bell oscillation can be varied as desired.

Another ingenious part of the apparatus is a pulley driven by a belt off the flywheel boss by means of which the clutch is automatically held in the disengaged position when the bell is not in use or when, if necessary, it is desired to ring it by hand. Connected with the pulley is a small drum to which is secured a leather strap and weight. To stop the bell ringing it is only necessary to switch off the current. The machine then continues to be driven by the bell—the clutch being still automatically engaged and disconnected—this giving rise to a braking action which quickly brings the bell to a stop. During its final oscillations there comes a period when the flywheel turns slightly in a reverse direction; this has the effect of raising the jockey pulley which frees the pulley, allowing the weight to fall, so disengaging the clutch and bringing into action a lever which retains it in that position. Conversely, the first action on starting the electric motor for bell ringing is to automatically raise the weight, so permitting the clutch to be engaged and disconnected by the automatic gear.

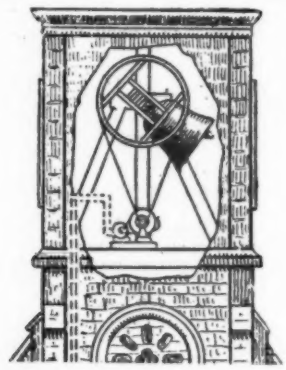


Fig. 2.—Installation in Belfry.

As usually arranged the motor and "Autosonneur"—the name by which the device is known—are located in the belfry (fig. 2), and the bell can be run at any time by the simple movement of a switch in any convenient part of the church, thus rendering bell-ringing independent of expert ringers. A separate motor and gear are necessary for each bell, but it is claimed that owing to the compactness of the gears, these can be readily installed and that the energy consumption is very small, the cost being only a few shillings per year per bell. Furthermore, being entirely automatic, it is claimed to require no more attention than occasional lubrication. Quite a number of churches in France have, we understand, already been fitted with the electric bell-ringing arrangement, among them being the Cathedrals at Troyes and Dole.

The Import Trade of China.

The following table shows the value of China's imports in 1924 of material of interest to the electrical and allied trades, indicating the principal countries of origin. The figures for 1923 are given in comparison, and notes of increases or decreases are added. It is probable that the trade credited to Hong-Kong was to a fair extent transacted with the United Kingdom.

Country whence imported.	1923. Taels.	1924. Taels.	Inc. or dec. Taels.
Brass and yellow metal; bars, sheets, wire, &c.—			
Total	1,351,000	1,699,000	+ 348,000
Hong-Kong	478,000	604,000	+ 126,000
Great Britain	122,000	102,000	– 20,000
Japan	658,000	752,000	+ 94,000
Belgium	6,000	16,000	+ 10,000
United States	3,000	8,000	+ 5,000
Germany	39,000	168,000	+ 129,000
France	19,000	27,000	+ 8,000
Copper bars, rods, sheets, plates, nails, and wire.—			
Total	851,000	963,000	+ 112,000
Hong-Kong	46,000	28,000	– 18,000
Great Britain	36,000	75,000	+ 39,000
Japan	722,000	719,000	– 3,000
Germany	37,000	128,000	+ 91,000
Belgium	8,000	8,000	—
United States	4,000	6,000	+ 2,000
Electrical materials and fittings.—			
Total	8,103,000	8,195,000	+ 92,000
Hong-Kong	610,000	647,000	+ 37,000
Great Britain	1,245,000	1,236,000	– 9,000
Italy	53,000	81,000	+ 28,000
Japan	2,495,000	2,171,000	– 324,000
Canada	50,000	7,000	– 43,000
United States	1,322,000	1,215,000	– 107,000
Sweden	34,000	13,000	– 21,000
Belgium	233,000	315,000	+ 82,000
Holland	219,000	367,000	+ 148,000
France	51,000	52,000	+ 1,000
Germany	2,064,000	2,171,000	+ 107,000

Country whence imported.	1923. Taels.	1924. Taels.	Inc. or dec. Taels.
Machine tools.—			
Total	463,000	638,000	+ 175,000
Great Britain	74,000	71,000	– 3,000
Denmark	2,000	7,000	+ 5,000
Japan	78,000	182,000	+ 104,000
United States	89,000	188,000	+ 99,000
Germany	219,000	158,000	– 61,000
Belgium	7,000	28,000	+ 21,000
Propelling machinery, such as boilers, turbines, &c.—			
Total	1,474,000	1,906,000	+ 432,000
Great Britain	720,000	993,000	+ 273,000
Japan	103,000	90,000	– 13,000
Canada	—	6,000	+ 6,000
United States	348,000	289,000	+ 59,000
Sweden	59,000	282,000	+ 223,000
Germany	229,000	143,000	– 86,000
Belgium	21,000	41,000	+ 20,000
Italy	3,000	49,000	+ 46,000
Machinery, other, not textile, brewing, refining, &c.—			
Total	12,909,000	12,783,000	– 126,000
Hong-Kong	999,000	529,000	– 470,000
Great Britain	3,343,000	3,120,000	– 223,000
Japan	1,560,000	1,898,000	+ 338,000
Canada	75,000	201,000	+ 126,000
United States	2,820,000	3,133,000	+ 313,000
Denmark	849,000	135,000	– 714,000
Germany	2,180,000	2,738,000	+ 558,000
Belgium	377,000	450,000	+ 73,000
France	146,000	104,000	– 42,000
Russia	10,000	16,000	+ 6,000
Sweden	125,000	169,000	+ 44,000
Netherlands	35,000	265,000	+ 230,000
Italy	223,000	206,000	– 17,000
Telegraph and telephone material.—			
Total	1,002,000	1,053,000	+ 51,000
Hong-Kong	89,000	39,000	– 50,000
Great Britain	287,000	323,000	+ 36,000
Japan	226,000	124,000	– 102,000
Canada	133,000	2,000	– 131,000
United States	64,000	77,000	+ 13,000
Sweden	78,000	252,000	+ 174,000
Germany	106,000	222,000	+ 116,000
Belgium	10,000	4,000	– 6,000
Scientific instruments and apparatus.—			
Total	1,024,000	1,210,000	+ 186,000
Hong-Kong	102,000	125,000	+ 23,000
Great Britain	130,000	101,000	– 29,000
Germany	269,000	323,000	+ 54,000
Belgium	4,000	10,000	+ 6,000
France	30,000	25,000	– 5,000
Japan	264,000	357,000	+ 93,000
United States	232,000	281,000	+ 49,000

The Haikwan tael = 3s. 7 15/16d. in 1924 and 3s. 5¾d. in 1923.

Selected Radio-Telephone Apparatus.

Recent Developments and Improvements.

The "Pelican Univernier."

A useful knob and dial substitute for the ordinary dial on the shaft of a condenser, variometer, or rheostat is marketed by Messrs. Pell, Cahill & Co., Ltd. It gives one very close control of such instruments, the mechanism being so designed that the speed of rotation of the knob is 12 times that of the shaft. The "Pelican Univernier" is made of moulded "Eboneum," and can be easily fitted to any existing condenser shaft without having to drill the panel; one hole only is needed for fixing.

A New Crystal Receiver.

The "Lowke Dane Tree" crystal receiving set which has been placed on the market by Messrs. Lowke & Sons, Ltd., is complete for reception on all wave-lengths of the British Broadcasting Co.'s band, including the high-power Daventry station, without the use of any plug-in coils. The set is enclosed in an oak cabinet, fitted with a hinged lid, the panel fittings being nickel plated. The detector is provided with a fine screw and push adjustment and it is set at an angle which is said to assist vision and manipulation.

The "Clearer Tone" Valve Holder.

An anti-microphonic valve holder has been placed on the market by Messrs. Benjamin Electric, Ltd. The component is made of bakelite, and is designed to minimise the transmission of outside noises and vibration to the valve filament, the valve being "floated" on springs which have one turn only, and themselves form the valve-pin sockets; thus each is a solid piece of metal from the tag to the valve leg with no soldered joints or wire connections. As shown in fig. 1, the holder is four-cornered, and terminals are provided at the

Fig. 1.—An Anti-microphonic Valve Holder.

corners, in addition to soldering tags for use in the case of a permanent fixture.

A Battery Switch.

A neat and effective little radio battery switch is marketed by Messrs. Benjamin Electric, Ltd. Fig. 2 will indicate its action; "it's off when it's in," and a sharp straight tug is

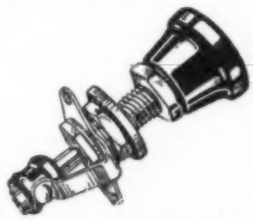


Fig. 2.—A Benjamin Push-pull Switch.

needed to establish contact, hence accidental switching is avoided. The simple single contact makes the device reliable, and it is easy to fix, one hole only being required, and there is but one locknut to adjust.

"Reco" Batteries.

Two interesting types of battery are being placed on the market by the Radio Equipment Co., Ltd., for use with broadcast wireless apparatus; they are also suitable for other purposes, of course. The high-pressure battery is unusual in that it is re-chargeable; as shown in fig. 3, plug sockets clearly

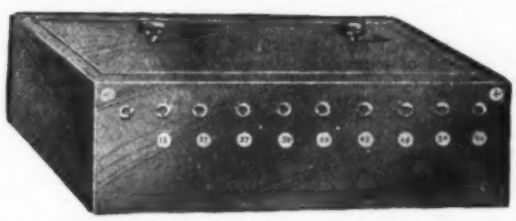


Fig. 3.—"Reco" Re-chargeable High-pressure Battery.

marked in voltage steps are arranged along one side of the box and the dimensions of a 60-volt battery are 5¾ by 9¼ by 3 in. and its weight is 6 lb. It is claimed that they are unusually noiseless and that they do not deteriorate when not in use. Bat-

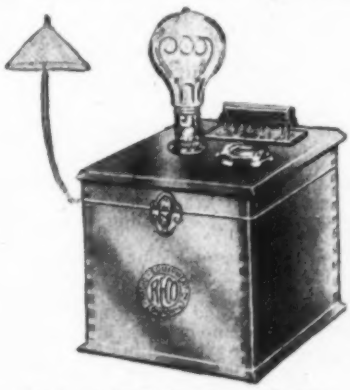


Fig. 4.—"Reco" Low-pressure Battery.

teries to give various voltages up to 115 V are made up of the requisite number of celluloid cells, each of 1.5 volts, of the Leclanché type; they are sent out in a charged state, the cells being filled with a jelly which dissolves when the cells are filled with pure water, forming a non-acid electrolyte. Such a battery may be re-charged by connecting it direct to the d.c.

domestic lighting circuit through a switch and suitable lamp. The low-pressure batteries, from 2½ to 6 volts, are suitable for dull-emitter valves (total consumption not to exceed 1 amp.) being composed of a smaller number of larger cells similar to those described above. They are enclosed in neat wooden boxes and may be connected to a d.c. lighting circuit of from 100 to 250 volts through the lamp as shown in fig. 4; another type is obtainable for connection to a d.c. supply which is not absolutely pure, it being claimed to reduce disturbances of this nature. The voltmeter and plug switch indicated in fig. 4 enable the voltage of each half of the battery to be ascertained, for if one half the number of cells only is used at a time the other half will recuperate, which is a characteristic of cells of the Leclanché pattern. These batteries operate continuously while they are connected to a source of supply, but should the charging supply fail, we understand the battery will continue to function for several hours.

Traders' Demonstration Outfit.

The Marconiphone Co., Ltd., has drawn our attention to a new departure in the form of an outfit which is primarily intended for the use of wireless dealers who wish to demonstrate. The equipment consists of a full-size "super" Round loud-speaker, a "super" amplifier with eight valves, five 60-volt h.p. accumulators, and two 6-volt l.p. accumulators. The outfit can be operated from any good 2-valve h.f. and detector set, or a special 2-valve set without feedback can be supplied for this purpose. The apparatus is similar to that used for the company's "public address" system and has been designed in response to requests for a set of equipment suitable for general demonstrations, concerts, &c. It is probably not generally known that a suitable Marconiphone installation to operate Round loud-speakers has hitherto cost something like £800; the new outfit will, however, be retailed at £140.

The Institution of Public Lighting Engineers.

Annual Conference at Leeds.

(Concluded from page 550.)

Electric Street Lighting in Rural Areas.

By Edward C. Lennox.

(*Abstract.*)

The lighting of rural areas with long straggling roads presents a rather different proposition from that of lighting city streets. The high standard of illumination aimed at in the busy thoroughfares of towns is not essential. Nevertheless, the lighting must be such as to fill certain conditions. Economic conditions are different. The town, with its high rateable value and comparatively shorter lengths of roadway to be lighted, and the rural area, with its very low rateable value and long lengths of roadway to be lighted, present two entirely different problems.

When comparing illumination values in candle-power of lamps of the vacuum type with similar-sized lamps of the gas-filled type, it should be borne in mind that, where stated in "candle-power in the maximum direction," the figures given refer to mean horizontal candle-power in the case of the former, whereas the measurement in the downward direction is given for the gasfilled lamp. The method of expressing the efficiency of lamps in spherical candle-power has obviated the possibility of error in comparing efficiencies; but the only satisfactory method of comparison is to state efficiency in terms of lumens per watt. This figure is obtained by dividing the total lumens obtained from the lamp, by the watts input.

One of the essential points to be considered in laying-out an electrical street lighting installation is the question of pressure variation. The voltage from the supply station is, of course, liable to some slight variation due to the varying loads; but these variations are usually kept strictly within prescribed limits. It often happens, however, that, with the idea of obtaining more value for money (by extending the working life of the lamp), lamps are fitted to a circuit with a pressure of (say) 10 per cent. below that for which they were made.

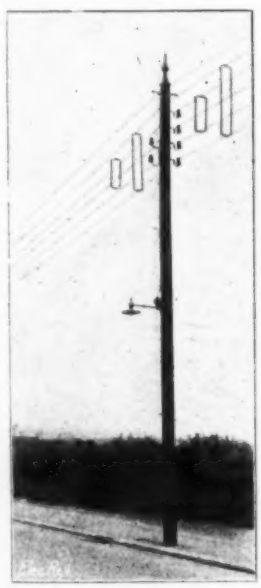


Fig. 1. Arrangement of Conductors at 250 Volts, showing Guards.

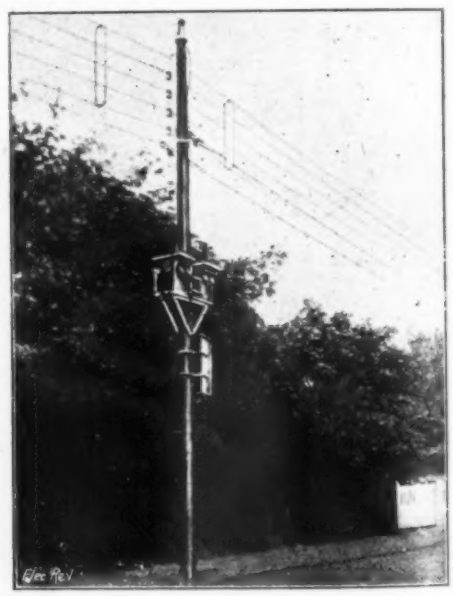


Fig. 2.—Switch Pole with Transformers: 100-Volt System.

When one is buying light, as is undoubtedly the case with street lighting authorities, it should be considered which is the most economical problem:—Running the lamp at a lower pressure than that for which it was designed, and so getting a longer life, but less efficiency, or running the lamp at a higher pressure, and so getting better efficiency, but shortening its life.

Take a 200-V, 100-W lamp costing 5s., supplied with energy at 3d. per kWh, normal life 1,000 hr., and average lumens 1,100. The cost of energy for the lamp giving 1,100 lumens for 1,000 hours is £1 5s., and the cost of the lamp is 5s., totalling £1 10s. With the lamp operated at 10 per cent. below the rated voltage, and its life extended to 1,500 hr., the light output would be reduced by 33 per cent., and the lumens output therefore would be 737 lumens. The consumption would be reduced by 15.5 per cent.; therefore, the watts consumed by the lamp would be 84.5. The cost of energy for the lamp would be 31s. 3d., and the cost of the lamp is 5s. Therefore, the total cost to obtain 737 lumens for 1,500 hr. would be 36s. 3d. At this rate the total cost of the lamp giving 1,100 lumens for 1,000 hours would be 36s. 1d.—an increase of 6s. 1d. over the cost of running at normal pressure. With the lamp operated at 10 per cent. above the rated voltage, and the life reduced to 667 hours, the light output would be increased by 40 per cent. The lumens output would be therefore 1,540 lumens. The consumption increase would be 17.5 per cent. Therefore, the watts consumed by lamp would be 117.5; cost of energy for the lamp giving 1,540 lumens for 667 hours would be therefore 19s. 6d., and the cost of the lamp is 5s. Therefore, the total cost to obtain 1,540 lumens for 667 hours would be 24s. 6d. At this rate, the total cost of the lamp giving 1,100 lumens for 1,000 hours would be 27s. 11d.—a decrease of 2s. 1d. on the cost of running at normal pressure.

These results should show the futility of under-running lamps, and it cannot be too strongly emphasised that all lamps should be run at their rated pressure; especially is this so in the larger and more efficient types of lamps, where the loss becomes ever greater.

The control of street lighting in a town or city has always been a vexed problem. The use of lamplighters invariably results in lighting up some time before dusk, in order that the last lamp shall be lighted in time, or in certain lamps not being lighted in time. This drawback in areas where the lamps are more or less congested is emphasised in rural areas where the lighting covers long distances in all directions, and where it would generally be necessary for the lamplighter to traverse long roads twice before the whole installation was lighted. It is impossible in these days to conceive that individual switching can be justified on maintenance costs alone. Time switches are therefore universally resorted to, which switch on and off automatically the whole of the lamps at predetermined times.

The choice of fittings suitable for street lighting by electricity is so wide that it is only necessary to lay down certain principles which should be borne in mind. They must be of robust design and weatherproof, well ventilated and fitted with an easily adjusted focusing device; they must also be so arranged that the light rays are directed so as to obtain the best distribution of light.

The fittings should be fixed as high as possible to give the

best results. Where large units of 300 W (4,300 lumens) are used, and mounted (say) 25 to 30 ft. high, with spacing of 300 to 400 ft., with directional type reflection, the resulting illumination would be even and leave little to be desired. It is not possible, however, owing to the question of cost, for such large units as these to be installed in the type of district under consideration.

Where expenses allow, an improved fitting can be used comprising a white enamelled reflector and a small prismatic refractor.

These fittings should be equipped with an anti-vibratory device, of which there are several on the market. The most efficient type of those adopted by the author consists of two concentric rings connected to one another by strips of phosphor-bronze gauze, which is very springy and which damps any vibrations that occur on the outer ring before they can reach the other.

Street lighting networks such as are required in rural areas can be carried out by several methods—by underground cable; by using the existing pole line carrying the supply company's overhead distribution networks, supplying at 250 V as the normal pressure for lighting purposes, to carry a switch wire, and using the supply company's neutral wire as a return; by utilising the supply company's existing pole lines to carry a separate street lighting network, consisting of line wires and return, operating at a similar pressure as the network; by running out new overhead networks at the supply company's pressure; by reducing the supply company's pressure to (say) 110 volts, and running out networks at this pressure; and by adopting the "series" system, widely used in America.

In considering the various systems, one must first compare the capital costs entailed. This is difficult to give with any degree of accuracy, as the costs are governed to a great extent by local conditions. The author has, however, for comparative purposes, prepared the costs for a complete lighting installation over a certain mile of roadway, but has been unable to obtain with accuracy figures showing the average cost of the "series" system. On an underground system (made ground) the average cost per yard of the network, including switches, &c., is estimated at 10s. 7d., and the average cost per lamp (40 yd. spacing) at £32; on a pole line with switch wire, using the network neutral as the return, the network (per yd.) and the lamp costs are 2s. 5d. and £8 2s. respectively; on a separate pole system, the network and lamp costs (including the cost of the poles) are 6s. 4d. and £15 10s. respectively; and on the 100-V system (including the cost of the poles) the respective costs are 3s. 4d. and £10.

The use of underground cable for street lighting schemes, while very desirable from many points of view, is almost out of the question for rural districts, owing to its prohibitive cost. Where it is unavoidable, the cable used is paper-insulated and lead covered, wrapped with hemp, and jute served. The cable should be looped into the foot of each lighting pillar, a special dividing box being available for this purpose, having glands for entry for two cables. This greatly facilitates testing for faults.

For reasons of economy, however, it is generally found impossible to put forward to rural district authorities an underground scheme for carrying out street lighting. There are many towns and villages, and thousands of consumers of electricity to-day, who would still be without supply if overhead work had been prevented. Where wood poles are used, these should be of Norwegian, Russian, or Swedish red fir cut in the winter season and retaining the natural butt of the tree. They should be creosoted to the Post Office Specification with 10 lb. of creosote per cu. ft. Steel poles, when necessary to take the greater stresses, should be tubular, and stepped in three pieces, to obtain relative strengths for the stresses imposed on different parts of the pole. Where an overhead network already exists for private distribution, the poles can be used to carry a switch wire, and the existing neutral can be used as a return. This is not always favoured by the supply company, as it interferes with their B.O.T. earth tests on the neutral, and is not desirable from the street lighting point of view, as the pressure drop along the neutral of the company's network, which may vary considerably during the lighting hours, would also affect the pressure at different points on the street lighting circuit.

New street lighting networks, comprising feed and return wires, when run out on existing private distribution networks, are erected on the sides of the poles opposite to the existing wires, and arranged so that like phases or neutrals are opposite to one another.

Where new construction of poles, &c., is necessary allowance should be made to cater for the erection of additional wires for further development of the street lighting network or private distribution network.

The reduction of the normal supply pressure of (say) 250 V to a pressure of (say) 110 V for street lighting purposes deserves every consideration. The advantages gained by reducing the pressure are:—Increased efficiency of the lamps, increased distribution value of light, lower costs of running out networks, and the use of stronger lamps.

In laying out a scheme of this type, which would be in an area already supplied at low pressure, the source of supply to the street lighting network should be fixed as near the centre of the area as possible, or the area, if large, should be split into sections, with a source of supply at the centre of each section. At this point are fixed the main switch and fuses controlling the whole installation, the time switch for automatically switching on and off the supply to the installation, and the transformer or transformers to reduce the pressure to 110 volts. The secondary side of the transformer is connected directly to the street lighting wires, which would radiate in all directions necessary, so as to reduce as far as possible pressure drops in the outlying parts of the sections.

The transformers used in these schemes are oil insulated, and housed in outdoor type cast-iron or sheet-metal tanks—the latter being lighter, and therefore preferable. The accompanying illustration, fig. 2, shows the arrangement of box and transformers on the pole.

Care must be taken to earth efficiently all ironwork, including the core and tank of the transformer.

Discussion.

Opening the discussion, Mr. W. BELL, M.B.E. (Camberwell), raised a question with regard to the table of costs set out in the paper, and said he found in London that gas was a more economical proposition for public lighting than was electricity.

Mr. H. E. FRYER said that if rural roads, such as the Great North Road, or the big arterial roads in the South and Midlands, could be lighted so efficiently that the ordinary considerate motorist need use only headlamps which were not too powerful and a nuisance to other road-users, the lighting profession would be doing a very great public service. In town streets few motorists used their big and powerful headlights, but in the dense darkness of the country they all had to use them. The present method of lighting, though excellent in its way, did not really meet the requirements of illuminating a road to an extent which made dazzling headlights unnecessary. The most comfortable conditions under which he had driven through town streets had been in shopping areas, where most of the light, without undue shadows, had come from the shop windows, entertainment houses, &c. It seemed to him that with that lighting the road got equal illumination, and it came from a direction which was at right angles to the line of travel; by putting a relatively high light on one side of the object on the highway and putting the other side of the object in shadow, it brought that object very clearly to the notice of the driver. If they were to have horizontal illumination rather than vertical on the roads under certain circumstances, objects, whether dark like the policeman's uniform mentioned by the president the previous day, or light like the policeman's white coat, would be more visible alike on dry highways or wet. If more lamps, at less distances, were placed on the great highways, it would be an advantage.

The PRESIDENT said that if they were to have electric lighting by overhead mains on the great roads of the country, it would probably be very much on the lines suggested by Mr. Lennox rather than on the lines which one saw at present. Mr. Lennox seemed to have hit on a very neat means of carrying overhead electric lighting conductors.

Mr. J. CHRISTIE, M.I.E.E., electrical engineer and manager, Brighton, said this question of overhead transmission in rural areas was a point which most engineers were having to consider very seriously. Overhead lines seemed to be the only effective method of dealing with the problem. Mr. Lennox's suggestions would be very useful. In his own district they had reconditioned their electric lighting. They were using 50-volt lamps in series, and had 1,500-watt lamps in certain areas, and found that the very robust filament required for carrying the current gave a most magnificent light.

Mr. R. B. MITCHELL, president of the Incorporated Municipal Electrical Association, congratulated the author of the paper on his contribution, and on the very neat arrangement of overhead wires which he had shown to the meeting. It was an example worthy of being followed all over the country. It seemed to him that the lighting of rural areas would only become possible by co-operation between the supply undertakings and the rural councils. He thought in the future it would become possible, because of the rapid extension of electricity supply even in rural areas now. The poles could quite well be run along roads and used for carrying supply wires as well as wires and lamps for lighting the roads. With regard to the advisibility of using lamps in series, he thought lamp makers were now becoming very efficient in producing high-voltage lamps of almost equal efficiency and life. He thought there would be very little to choose between them. In the matter of electric lighting in rural areas, there should be some relaxation of the very rigid Board of Trade regulations, which were framed to prevent accidents, but which in effect were probably more rigid than was necessary and were a great handicap to the development of rural electric lighting. He thought there was a happy medium which would reduce the cost of overhead lines very materially.

Mr. A. C. CRAMB, M.I.E.E., borough electrical engineer, Croydon, said the paper was a very valuable one and illustrated an excellent system of lighting. A point he would like to raise was whether the lamps on Mr. Lennox's system were at a reasonable height, seeing they had to be some distance apart; whether by altering the height they might get something better in the way of directional lighting. There was room for considerable improvement in this direction, and the Institution might debate the possibilities of some fitting which would direct the rays up and down the road. The condition and organisation of this country's roads had become an appalling scandal, and the Government had had to set up the Ministry of Transport, which had earned a great deal of gratitude for what it had done so far in road improvement. It was highly

important that roads should be properly illuminated. The illumination of the streets and roads of this country, taken as a whole, was appalling. Even in London there was no system or continuity. There were certain bright spots where there was a brilliant display of lighting, but there were others which were very much the opposite. What was required was some co-ordinating effort, just as was being done with regard to road construction. That Institution could do a very fine work if it could put forward to the Ministry of Transport suggestions with regard to the systematic lighting of the roads of the country.

Mr. W. J. Liberty, lighting superintendent, City of London, and hon. secretary of the Institution, said he entirely sympathised with the suggestion that there was great need for co-ordination of lighting systems in the London area. One of the reasons why there was this multiplication of forms of lighting in London was that around the City Corporation itself there were now some thirty metropolitan boroughs, each with its own ideas of lighting. Some had got installations of electricity. Others had deeply-rooted ideas in favour of gas. The result was that the motorist moved from intense brightness to great darkness. This was more common in the metropolis than anywhere else, because other districts had only one responsible local authority. He had known travellers run into something because they were blinded by the relative darkness of lesser lighting after a period of great brilliancy, though to anybody who had not passed out of that brilliancy the darkness was not by any means so serious.

Mr. Leon Gaster, of the Illuminating Engineering Society and the National Safety-First Council, said that good road lighting had become a subject demanding very special study from a national safety point of view. He did not think there would be so serious a difficulty in getting proper light control if a good case could be presented for such control. He saw no reason why some portion of the revenue from motor taxation should not be allocated to road lighting. Last year there were 80,000 road accidents, and statistics of that kind should be utilised to strengthen the case for proper road lighting.

Mr. Fowler (Dundee) said that in Dundee they had a main road three miles long and 160 ft. wide, which they had been called upon to light in sections. It was a road to relieve central city traffic. They had fitted up 300-watt lamps 25 ft. high, with a spacing of only 40 yards. In his opinion that was sufficient to light that very broad highway, for traffic both inward and outward.

Mr. Lennox, in reply to the discussion, said that if this question of road lighting were taken up as a national affair and put into the hands of rural surveyors themselves for control, they would no doubt look at the lighting question much more sympathetically. It was simply because lighting was left in the hands of local parishes that the rural surveyor was at present not very sympathetic and looked upon lighting poles as a curse. The costs which he had given in the paper included the cost of the lamps. The saving he got, of 2s. 1d., was more than would be the actual cost of replacing the lamp. Fittings should be cleaned at least once a month and preferably perhaps once a fortnight, and the man who cleaned saw the lamps which were out, and replaced them where necessary. Headlights on motor-cars would remain a necessity for many years yet, even with lighting of the roads such as he had described. He did not think they could seriously contemplate series lighting for rural areas because of the cost and the question of going to the Government. It was a great handicap to electrical development in rural areas to have to have the Board of Trade regulations so rigidly round their necks. They could hardly move for those regulations. If the Electricity Commissioners were to look on the matter in a broader attitude he thought it would be for the benefit of the whole community. He entirely agreed that all possible statistics should be secured, to be put before any authority concerned in the question of public safety. With regard to the need for co-ordination, which he agreed was very important, he thought it might be well for that Institution to frame a resolution with a view to a petition being sent to the Ministry of Transport, urging that authority to consider this question of road lighting.

Public Lighting by Gas.

A paper on this subject, prepared by the Distribution Department of the South Metropolitan Gas Company, was read by Dr. J. S. Thomas; it pointed out that the present inadequate lighting of the streets was due to the inadequate expenditure on this service, and criticised adversely the adoption of luminous flux as the fundamental quantity in the discussion of lighting problems, preferring the specification of candle-power and its distribution. The chaotic state of the subject in respect of the diversity of lighting appliances and lighting specifications was deplored, and commendation was expressed for the valuable work done by Mr. A. P. Trotter. The lighting of 95 per cent. of the streets was classed as "inferior beacon lighting," and it was claimed that gas was much cheaper than electric lighting.

In the discussion Mr. L. Gaster said that accidents by night were far in excess of those by day, due to insufficient lighting. Mr. A. C. Cramb referred to the importance of giving the best possible illumination at the minimum cost. Mr. S. B. Langlands said that the Institution should tackle the whole problem in conjunction with the Ministry of Transport. Mr. T. Newton urged the need for a standard table of illumination. Mr. J. Stewart agreed with Dr. Thomas regarding the mode of specification, and drew attention to the new specification of the B.E.S.A. for a portable photometer. Other speakers took part in the discussion, and Dr. Thomas, in reply, said the public had not yet been educated to realise the need for better street lighting; it was not a case of gas *versus* electricity, but of getting the necessary money—good light could then be provided.

Correspondence.

Correspondents should forward their communications **at the earliest possible moment.** *No letter can be published unless we have the writer's name and address in our possession.*

Broadcasting Power.

The *Daily Express* has seen fit to give prominence to an article by Prof. A. M. Low on a subject of vital commercial importance, namely, the transmission of power, and claims to speak in the name of science in favour of a system of broadcasting power.

Whilst admitting the need for educating the public mind to the urgent necessity and commercial importance of scientific research, it cannot be too strongly stated that the extravagant prophecies of Prof. Low are liable to mislead those who have no special knowledge of the subject and to raise expectations impossible of fulfilment, which are bound to bring science into disrepute.

The bankruptcy of science is now almost a catch phrase, which is indeed deserved if such vapourings in the Press are allowed to go unchallenged. The gentle sarcasm of Senatore Marconi as to the remoteness of its solution is not sufficient.

I claim as a member of the community to raise my voice against it, although it is difficult to deal with the matter seriously.

It is not as if there were no data on which Prof. Low could form an opinion; we have at the present time high-powered stations broadcasting energy, but not a thousand-millionth part of that energy is usefully employed.

If he proposes to limit himself to beam transmission, experience again tells us that for any useful distance the improvement is very slight.

The experiment which caused this brain wave is a very old one, often done to amuse the young student—the melting of a tenpenny nail without wire attachments, by induced currents. This is a very well-known high-frequency experiment, and is accomplished by the very opposite method to that which Prof. Low proposes, namely, by concentration.

H. P. Amphlett, F.P.S.L.

London, *September 25th*, 1925.

The Æsthetic Aspect of Advertisements.

In view of your Advertisement Competition, the following parable on the æsthetic aspect of advertisements may be of interest to readers of the Review.

There is a street in Progress Town called Advertising Street, and it is through this thoroughfare that all who wish to buy must pass. Some hurry through without stopping—these are wise. Others observe with wise and serious faces and collect and collate and revise and compare and consult statisticians and publicity experts, and do all manner of such things—these are not wise. Some few, who have no intention of buying, loiter along with much amusement.

This street is exceeding noisy, for every advertiser there is shouting at the top of his voice day and night. So loud are their voices that, though everyone protests at the clearness of his neighbour's cries, the buyers cannot distinguish what one of them is saying. Some shout the same thing day after day, year after year, until the antiquity of their dress and accent draws upon them the ridicule of their fellows. Others change their fashions with such bewildering rapidity that the buyers are puzzled afresh every day in making out who they are. Others, again, have a set rotation of fashion to which they adhere, and which earns for them the nickname of "farmer" from their enemies. And there are always at least six who have been standing on tip-toe and all waving the same article and shouting: "Mine is the best," with such diligence that they have entirely forgotten why it is the best, nor could they remember if they tried. And altogether there is such a noise and a bustle and a waving and a confusion that it is not uncommon for the poor buyer to find he has ordered four times what he thought of getting and ten times what he wants of an article he does not know how to use.

But besides these general noises, there are some particular strange antics to which I especially desire to draw attention.

There was once an advertiser here, named Irrelevance, who, having hanged himself by the heels from the doorway of his place of business, said: "Surely the admirers of my gold watch will enter this door." But of all who passed by and pitied him, not one so much as noticed that he had a gold watch. He was much distressed at this, and grew thinner every day until, when I last heard of him, he had shrunk to the thickness of a bankruptcy petition. A little while after another and stronger advertiser thrust him aside and, widening the doorway, took up his abode there.

There is also another advertiser who, having thrown mud over himself with a spade, put on a clean shirt and collar and, disdaining lavender water, pushed his way among the buyers with much assurance.

There are others of a weird, and some of a horrible, sort. One of the former, who is well known there, though not very prosperous, goes about shouting: "Although there are 14 hippopotami in England, not one has trodden on my toes, which are free from corns." The buyers laugh at him, but some few, wanting foot-salve, buy a box of his. One of the latter sort of advertisers, who is yet better known and very prosperous and confident, sets his clerks to dig up the graves of illustrious men, such as Confucius, Drake, and Shakespeare. He then hangs their bones upon his kettles, his pots, and his pans. By this means he is enabled to make a great noise and hopes to charm the skies to drop gold upon him.

Advertising Street was first built by a professor, who said: "Tell people that there is a sky, and they will want to buy your blue saucepans." And although he taught his workmen this song, and although they chanted it while they built Advertising Street, he never could say why the sky should tell you about saucepans. Perhaps it is because the description which a grocer friend of mine read in a book by a man named Conrad, which is a description of the kings of the West and of the East, reminded him that his stock of yellow and red cheese was low. Though why sunsets should remind grocers of cheese is known neither to me, nor to you, nor to any other creature.

R. Twigg.

Great Malvern, *September 26th*, 1925.

Radio Aerials and Lightning Discharges.

A few instances have been reported during the past summer of wireless apparatus being destroyed by lightning, but considering the number of aerials now in use the damage has been unexpectedly small. The extent to which aerials are affected by lightning discharge and the results likely to arise therefrom are questions of practical importance to all users of wireless apparatus, and an attempt is being made to collect information relative to actual cases in which aerials and apparatus have suffered in this way. I shall be glad if I may use the publicity of your columns to ask anyone, and everyone, whose apparatus has been damaged to forward full information to me at the address given below. The data particularly required are:—

(a) The date and time of the occurrence.
(b) The position and approximate dimensions of the aerial.
(c) The nature and position of the earth connection.
(d) A brief description of surroundings, *i.e.*, position of adjacent houses, trees, telephone wires, &c.
(e) Whether the aerial was directly earthed or whether either receiving or transmitting apparatus was in circuit.
(f) The fullest possible description of the incident and the nature of the damage done.

C. L. Fortescue.

City and Guilds (Engineering) College,
Exhibition Road, London, S.W.7.
September 26th, 1925.

The Cost of Living in Bombay.

I wonder if one of your readers who has had recent experience in Bombay would be good enough to publish the usual particulars requested by those contemplating work in that city.

Also, what would be the equivalent in Bombay of a salary of £300 per annum in this country?

Sales Engineer.

September 29th, 1925.

Rural Electricity Supply.

It is unfortunate that Mr. Fennell is so prone to make overstatements. In his letter published in your issue of September 25th he writes:—"The Post Office can, and do, put their lines underground when they wish; for instance, in cities and when leading into exchanges. Their talk of speech efficiency limits is a device to save themselves trouble—regardless of the enormous expense their refusal imposes on other utility undertakers, and therefore upon users of electricity."

The statement made in the latter part of this quotation is inaccurate. When projected high- and extra-high-pressure overhead lines will cross Post Office overhead lines, first consideration is given by the Post Office as to whether its lines can be placed underground without undue degradation of circuit efficiency, and in the great majority of cases it is the Post Office lines which are diverted to underground. Taking the country as a whole, I should say that at appreciably more than 75 per cent. of the crossings this is the method adopted, as the best way of meeting the difficulty. To say, therefore, that "their talk of efficiency limits is a device to save themselves trouble" is not only a reflection on the good faith of the engineers dealing with the matters, but is a very grave misstatement of the actual position. Moreover, Mr. Fennell has no excuse for making such a charge, as in a recent case in which his company notified the erection of an overhead power line with proposed crossings of Post Office routes at 29 points, the Post Office has offered to go underground at 22 of them!

Mr. Fennell may regard such loose accusations as a necessary part of his declared policy of "making ourselves a nuisance to the Post Office officials," but surely it cannot but be a disservice to his legitimate cause of pushing rural electrification?

S. C. Bartholomew.

Office of Engineer-in-Chief, G.P.O., London.
October 2nd, 1925.

The Roman Baths at Bath.

With all due deference to Messrs. Henley's regard for the principle of "Truth in Advertising," which regard we fully share, we cannot admit that any misleading impression could be caused by our advertisement in your issue of August 7th (supplement page 11). Not the slightest reference was made in our advertisement to the electrical installation at the Baths, but only to the Roman plumbing there. It might as well be argued that we should not quote in a wiring advertisement some remarks on electrical matters by, let us say, Mr. Baldwin, without previously assuring ourselves that his house had been wired on our system.

We admit, however, that our idea might have been used with even more point by Messrs. Henley's—if it had occurred to them first.

Johnson & Phillips, Ltd.
Charles Stewart, *Director.*

London, *October 2nd*, 1925.

The Manufacture of Induction Motors.

I am much obliged to Mr. Parkinson for his reply in this week's Electrical Review to my letter of the 14th ultimo, and desire to thank him for his kind invitation to investigate personally the claim put forward, but I regret to say I feel that no particular purpose would be served by doing so, as in all probability any information furnished would be in confidence and my objection to this would be that the advertisement referred to endeavoured to belittle the whole British electric motor trade and received a large amount of publicity, and therefore Mr. Parkinson should produce evidence, if he can, to substantiate his claim, and this evidence should have the same degree of publicity as his original claim.

I quite realise that if Mr. Parkinson has received internal information with regard to the turnover of various British manufacturers without their knowledge and consent, it is of a confidential nature and no doubt the persons who have obtained this information have every desire to remain anonymous. Nevertheless, I quite fail to see why this desire for secrecy on the part of Mr. Parkinson should prevent his replying to my questions Nos. 2 and 4.

With reference to Messrs. Parkinson's advertisement appearing in this week's Electrical Review, I must congratulate them on their turnover for July, and would be very interested to hear the total for June and August, and why, if as they mention "every month our output increases," the August total is not also shown.

Question 3 in my letter: "On what period of time is their estimate based," is replied to in their advertisement this week in the Electrical Review, and by a strange coincidence we also had an excellent order book for that month; our total a.c. industrial power motors amounted to 756, as well as a large number of d.c. dynamos and motors, which machines Messrs. Parkinson do not manufacture. If desired the Editor of the Electrical Review, or any other impartial person, can verify this figure.

By a simple calculation it would therefore appear that if Messrs. Parkinson and Crypto advertised jointly, we could claim instead of 1 in 4, 1 in 2½ or 40 per cent. of the total trade of the country in these motors, and we would not add, as they do at drapery sales, "for four weeks only."

The Crypto Electrical Co., Ltd.
J. G. Shaw, *Managing Director.*

London, *October 3rd*, 1925.

Is the Contracting Business Degenerating?

Judging by the weekly reports in your "Contracts Closed" columns, I should say the answer to the above question is in the "Positive." In this week's issue the following are noted: Installations in 380 houses for £2,772 (a little under £8 per house), the highest tender being £6,174. Corporation Depôt accepted at £184, the highest tender being £257. Town Hall accepted at £103, the highest tender in this case being £197. In the foregoing cases I am not *directly* interested, but as an electrical contractor who turns out high-class work at consistently low rates, it is with feelings of disgust that I read the above figures. It is fairly obvious that there is something wrong, and it is little wonder that your budget of bankrupts gets larger weekly. My principle is that it is better to do nothing than to work for nothing and make a present of £20 to your cheesparing client. Recently I was asked to tender for a school installation in an outlying district. My quotation was £89, but a firm of plumbers cut me out by £19. This meant that they intended to carry out the contract £9 below cost. For comparison purposes I afterwards made up an estimate based on all kinds of Continental and other rubbish, and even then my price worked out at £81. How is it done?

Polyphase.

October 3rd, 1925.

Legal.

The Assessment of an Electric Sign.

In the Glasgow Valuation Appeal Court on September 29th, the Scintillating Advertising Company (Scotland), Ltd., Glasgow, appealed against an assessment of £400 and suggested £49 as the proper figure. For the company it was explained that the subject involved was an electrical device erected on the roof of a building. All that was outside the building was a hoarding, fitted to which was a large number of electric lamps which were illuminated to produce various messages. The mechanism operating the sign consisted of a dynamo, transforming plant, and 4,000 movable types. The firm operating the sign paid a rent of £100 for the use of the room.

Mr. Alexander Walker, City Assessor, said that the sign appeared on the supplementary valuation roll for last year at £75. The rent of the room itself did not enter into the case. It was only the erection, including machinery, which was being valued. It was his contention that the erection was held by the appellants from the London firm on a four years' lease, which might be extended until the expiry of the patent. Replying to a question, the agent for the appellants stated that the patent had ten years to run.

The Court fixed the assessment at £60, and the Assessor intimated that he would lodge an appeal.

Warehouse-Breaking.

T. Watson, J. Grieveson, W. C. Sefton, and J. W. Sulsby, of Framwellgate, Durham, were remanded at Durham on September 30th on a charge of warehouse breaking and of malicious damage to electrical fittings at the Durham main electrical power station, the property of the Newcastle-on-Tyne Electric Supply Co., Ltd. Watson said that he, Sefton, and Sulsby found a quantity of brass and copper on the floor, which they put in a sack; they then knocked off with a hammer the fittings of the engine, which they put into two sacks. Grieveson admitted helping to dismantle the engine. It was stated that two 6,000-V switches had been completely broken, and all the copper and brass had been removed. The total damage was estimated at £300.

Published Specifications.

Compiled expressly for this journal by Patent Agents.
The name of the applicant's patent agent, if any, will be found on the printed specification.
The numbers in parentheses are those under which the specifications will be printed and abridged, and all subsequent proceedings will be taken.

1924.

6,666. "Automatic electric motor starters." A. Roberts and Mather and Platt, Ltd. March 15th, 1924. (239,555.)

8,762. "Dynamo-electric machines." British Thomson-Houston Co., Ltd., and A. A. Pollock. April 7th, 1924. (239,560.)

9,124. "Variometer and vario-coupler." J. C. N. Eastick. April 10th, 1924. (239,561.)

9,175. "Synchronous telegraphy." J. V. Foll. April 10th, 1924. (239,562.)

9,254. "Systems of electrical distribution." British Thomson-Houston Co., Ltd. May 11th, 1923. (215,729.)

11,222. "Speed-regulating devices." Siemens-Schuckertwerke Ges. May 9th, 1923. (215,757.)

11,406. "Alternating current electric machinery." F. Creedy. May 8th, 1924. (Cognate application 15,770/25. A divided application on 27,911/24.) (239,571.)

11,834. "Transformer for mercury-vapour lamps." H. Busse. May 24th 1923. (216,508.)

13,283. "Electrical rheostats and similar regulators, applicable also to fuse-holders and the like." Berkeley & Young, Ltd., N. W. Gilbert and H. C. E. Jacoby. May 30th, 1924. (239,575.)

13,767. "Methods of balancing cable circuits." Western Electric Co., Ltd., W. E. Mougey and J. Collard. June 5th, 1924. (239,577.)

13,827. "Intercommunication telephone systems." V. Hutchinson. June 6th, 1924. (239,581.)

13,965. "Inductance coils." J. P. Jayne. June 10th, 1924. (239,586.)

14,101. "Thermionic vacuum tubes or valves." C. Seymour and J. L. Miller. June 10th, 1924. (239,594.)

14,221. "Generation of waves by thermionic valves for wireless telegraphy and telephony." C. Seymour and G. Shearing. June 12th, 1924. (239,599.)

14,298. "Electroscopic apparatus for testing the conductivity of various materials." H. T. Scott-Huntington. June 13th, 1924. (239,606.)

14,371. "Production of electrodes for alkaline storage batteries." J. F. Monnot. June 13th, 1924. (239,609.)

14,405. "Telegraph apparatus." Automatic Telephone Manufacturing Co., Ltd., and H. H. Harrison. June 13th, 1924. (239,610.)

14,421. "Manufacture of welded tubes by electric resistance welding." E. Schroder. June 14th, 1924. (239,614.)

14,449. "Automatic control of dynamo-electric machines." British Thomson-Houston Co., Ltd., and F. P. Whitaker. June 14th, 1924. (239,615.)

14,772. "Telephone systems." Automatic Telephone Manufacturing Co., Ltd. June 18th, 1924. (226,154.)

15,134. "Electrical transmitters for use in automatic telegraphy." Creed and Co., Ltd., and F. G. Creed. June 23rd, 1924. (Addition to 191,772.) (239,626.)

15,416. "Timing devices." Western Electric Co., Ltd. (G. Deakin). June 26th, 1924. (239,630.)

15,484. "Terminals for use in wireless instruments and for like purposes." N. Garnett. June 27th, 1924. (239,632.)

15,514. "Electric insulating materials and electric insulators." F. V. Wythes and Siluminite Insulator Co., Ltd. June 27th, 1924. (239,633.)

15,671. "Electric measuring instruments of the moving-coil type." British Thomson-Houston Co., Ltd., A. P. Young and A. G. Salisbury. June 30th, 1924. (239,636.)

16,712. "Automatic control of electric motor converters." British Thomson-Houston Co., Ltd., F. P. Whitaker and C. J. Sarjeant. July 11th, 1924. (239,650.)

16,778. "Electric connection sockets or like electrical fittings." G. A. G. Davies and H. W. Kent. July 12th, 1924. (239,651.)

17,953. "Interlocking of electric switch cubicles." A. H. Railing, C. C. Garrard and P. H. Coales. July 28th, 1924. (239,660.)

18,222. "Means of supplying thermionic valves from alternating-current mains." R. S. Elven. July 30th, 1924. (Cognate application 1,328/25.) (239,663.)

18,638. "Radio telegraphic systems." W. J. Mellersh-Jackson (A. Taylor). August 5th, 1924. (239,670.)

19,101. "Electric inductance coils." F. H. Alston. August 12th, 1924. (239,674.)

19,783. "Holders for electromagnetically coupled coils." H. A. Yoward. August 21st, 1924. (239,679.)

19,798. "Holding-means for inductance coils for use in wireless systems." G. A. Mitchell. August 21st, 1924. (239,680.)

20,207. "Electric terminals or other screw couplings." W. J. Polyblank and H. A. Watts. August 26th, 1924. (239,687.)

20,291. "Aircraft lamps." A. L. Davis. August 27th, 1924. (239,688.)

21,394. "Rheostats." C. A. Collins. September 10th, 1924. (239,702.)

21,985. "Cooling arrangements for use with dynamo-electric machines." English Electric Co., Ltd., and E. R. Briggs. September 17th, 1924. (239,705.)

22,860. "Road vehicle lamps." J. Lucas, Ltd., and O. Lucas. September 27th, 1924. (239,711.)

23,691. "Sound reproducing apparatus." British Thomson-Houston Co., Ltd. March 27th, 1924. (231,421.)

23,786. "Electrically heated kettles and like vessels or utensils." Hecla Electrics Proprietary, Ltd. October 22nd, 1923. (223,8.6.)

24,069. "Electric fires or radiators." H. H. Berry. October 10th, 1924. (Cognate application 2,132/25.) (239,724.)

24,577. "Electric motor control gear." English Electric Co., Ltd., and F. D. H. Bremner. October 16th, 1924. (239,725.)

25,899. "Electric discharge tubes." General Electric Co., Ltd., A. C. Bartlett, R. Le Rossignol, and H. W. B. Gardiner. October 30th, 1924. (239,736.)

26,006. "Electric apparatus for the elimination of aperiodic disturbances." H. J. J. M. De Regnauld de Bellescize. December 28th, 1923. (226,784.)

28,764. "Devices for protecting electrical circuits from overheating." Calor Elektrizitats-Ges. and O. Dreyer. December 1st, 1924. (239,741.)

28,922. "Means for adjusting electric lamps." M. J. Railing and E. L. Randall. December 2nd, 1924. (239,743.)

29,337. "Signalling systems." Western Electric Co., Ltd. (Western Electric Co. Inc.). December 6th, 1924. (239,745.)

29,546. "Apparatus for heating liquids by electricity." H. Robinson. December 9th, 1924. (239,749.)

29,821. "Variable electrical condensers." H. R. Hodgson and C. Millar. December 11th, 1924. (239,751.)

30,146. "Electric accumulators." Chloride Electrical Storage Co., Ltd., and B. Heap. December 15th, 1924. (239,754.)

30,259. "Induction furnaces." British Thomson-Houston Co., Ltd. (General Electric Co.). December 16th, 1924. (239,755.)

1925.

288. "Electrodes for electric furnaces." Det Norske Aktieselskab fur Elektrokemisk Industri Norsk Industri-Hypotekbank. January 17th, 1924. (227,821.)

610. "Vacuum electric tubes." Westinghouse Electric & Manufacturing Co. January 8th, 1924. (227,454.)

708. "Overhead lamps." Dr. K. Markau. January 9th, 1924. (Addition to 227,461.) (227,462.)

1,930. "Electric junction boxes and the like." Callender's Cable & Construction Co., Ltd., and E. Warbrick. January 22nd, 1925. (239,771.)

5,875. "Lighting installations." R. Bosch Akt. Ges. April 3rd, 1924. (231,842.)

6,770. "Method of producing cores of powdered and compressed magnetic material for induction coils and the like." British Thomson-Houston Co., Ltd. (International General Electric Co. Inc.). March 12th, 1925. (239,787.)

7,481. "Tungsten arc lamps." General Electric Co., Ltd. June 21st, 1924. (235,840.)

7,635. "High-pressure mercury-vapour electric lamp." K. Mensing. March 31st, 1924. (231,481.)

8,625. "Method of and means for frequency multiplication in electrical phenomena." C. Lorenz Akt. Ges. May 31st, 1924. (234,781.)

8,822. "Caps for the carbons of batteries." E. Kleinmann. April 2nd, 1925. (239,793.)

9,934. "Spring holder for incandescent electric lamps." W. Eberl. April 16th, 1925. (239,800.)

13,412. "Coupling device for combined electric starters and dynamos for automobile engines." Soc. Anon. pour l'Equipement Electrique des Vehicules. November 18th, 1924. (Addition to 237,541.) (239,809.)

13,432. "Electromagnets." British Thomson-Houston Co., Ltd. May 24th, 1924. (234,509.)

13,591. "Electron-discharge apparatus and circuit arrangements employing them." British Thomson-Houston Co., Ltd. May 29th, 1924. (234,809.)

15,680. "Electric control systems." British Thomson-Houston Co., Ltd. June 17th, 1924. (235,885.)

16,729. "Illumination device for projecting apparatus." A. Konieczny. July 7th, 1924. (236,553.)

International Conference on High-Pressure Lines.—It is proposed, subject to there being a sufficient demand, to publish an English edition (in two volumes of about 1,100 pages each) of the papers read at the International Conference on High-pressure Lines held in Paris from June 16th to 25th, 1925. The volumes will also contain a report of the discussions. If the demand reaches 400 copies, the price will be four pounds for the two volumes, but in the event of 800 copies being subscribed for, the price will be two pounds ten shillings. In order that an early decision may be arrived at as to whether to publish an English edition, those wishing to subscribe for copies are requested without delay to inform Monsieur Tribot Laspière, Union des Syndicats de l'Electricité, 25, Boulevard Malesherbes, Paris, of the number of copies they will require. A French edition of the papers and discussions will also be published, provided that not fewer than 1,000 sets are subscribed for. The price will be 200 francs per set, but after November 1st, 1925, the price will be increased to 250 francs. Orders for the French edition should also be sent to M. Tribot Laspière at the address given above.

A Power Company and a Pumping Failure.—A company in the State of Wisconsin, U.S.A., brought an action against a power company two or three years ago, alleging that the failure of the latter to supply power for pumping during a fire at the claimant's works involved the claimants in additional loss, put at $250,000. The case was at first dismissed but subsequently a jury awarded the claimants $47,000. The Supreme Court of the State, however, has recently reversed this decision and dismissed the action.